Are Government Spending Multipliers State Dependent? Evidence from U.K. Historical Data

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Abstract

A recurring question in macroeconomic policy debates is whether government multipliers are higher during periods of economic slack or when interest rates are at or near the zero lower bound. This paper aims to shed further light on this issue by expanding the recent literature pioneered by Ramey (2011), which uses the defense narrative approach to identify shocks in the expected present value of government spending. Using newly constructed quarterly historical data for the U.K. from 1910 to 2016, I estimate multipliers that are below unity irrespective of the amount of slack in the economy or the monetary policy regime. Overall, there is some evidence that multipliers are higher during periods of high unemployment in the U.K. but no evidence of larger multipliers at the zero lower bound.

1 Introduction

With the onset of the Great Recession in 2009, questions regarding the effectiveness of spending stimuli and the merits of austerity returned to the forefront of the macroeconomic policy debate in developed economies faced with persistently high unemployment and the need for eventual fiscal consolidations. This discussion has most recently been revamped in the United Kingdom following its decision to leave the European Union and the subsequent deteriorating economic outlook due to the uncertainty surrounding the exit process, with the UK Treasury signaling a shift towards easier fiscal policy.¹ Questions concerning the magnitude of the government spending multiplier and whether it changes according to different states of the economy are central to this debate.

The majority of estimates in the empirical literature based on aggregate data find modest multipliers, mostly below unity, suggesting that increases in public spending are ineffective in stimulating private activity, or, alternatively, that austerity measures are unlikely to significantly harm growth. The majority of these estimates are taken from averages for a specific country over a certain historical period as aggregate government spending multipliers can only be obtained by exploiting "natural experiments" in national data, given the impossibility of conducting randomized control trials across different countries. While the theory suggests that several characteristics can significantly alter the magnitude by which fiscal changes affect growth – namely, whether these changes are permanent or temporary, the method through which they are financed, the level of resource utilization in the economy, or how monetary policy responds to such changes – aggregate economic data is subject to endogeneity problems that make answering these questions a challenging exercise.

¹ See "With Philip Hammond's Plan, U.K. Shelves Austerity" The New York Times, 23 November, 2016. Web.

The empirical literature has recently begun to explore whether multiplier estimates vary according to the amount of slack in the economy (e.g. Barro and Redlick (2011), Auerbach and Gorodnichenko (2012, 2013), Fazzari, Morley, and Panovska (2015)) or to different monetary policy regimes (e.g. Miyamoto, Nhuyen and Sergeyev (2015)). The first question attempts to answer the traditional Keynesian assumption that multipliers are high during deep recessions, as output is demand-driven and government spending acts as a substitute for subdued private activity. The second question is a more recent research interest that has arisen as a response to theoretical papers which use New Keynesian DSGE models to suggest that government spending multipliers are higher when interest rates are at or near the zero lower bound (e.g. Christiano, Eichenbaum, and Rebelo (2011)).

However, Ramey (2011) highlights important methodological issues in the burgeoning empirical literature on state-dependent multipliers, by showing that the established identification method for spending shocks through a standard vector autoregression (SVAR) misses their timing. The paper proposes a novel approach to measuring anticipation of spending shocks through narrative methods of defense spending, where news sources are used to compute changes in the expected present value of government spending previously unanticipated by the economic agents. Using this method, subsequent studies (Owyang, Ramey, Zubairy (2013), Crafts and Mills (2013), Ramey and Zubairy (2014)) estimate government spending multipliers across both slack states and monetary policy regimes. Owyang et al. (2013) and Ramey and Zubairy (2014) construct defense news series for the U.S. since 1889 and for Canada since 1912, estimating multipliers below unity for both slack and non-slack states, with no evidence of larger multipliers during higher unemployment periods for the U.S. and some evidence for Canada. Ramey and Zubairy (2014) finds mixed results for multipliers at the zero lower bound, with some specifications indicating multipliers as large as 1.5. Crafts and Mills (2013) also constructs a defense news series for the U.K. from 1922 to 1938, which includes prolonged periods where interest rates are near the zero lower bound, finding multiplier estimates below unity (between 0.5 and 0.8). However, the paper does not estimate separate multipliers for ZLB and non-ZLB periods.

This paper aims to extend the small empirical literature on the state-dependence of government spending multipliers using defense news shocks by constructing new quarterly data on estimates of changes in the expected present value of government spending for the United Kingdom from 1910 to 2016, thus expanding the narrative series in Crafts and Mills (2013). As argued in Owyang et al. (2013), covering the entire 20th Century contains potentially richer information than the post-WWII sample commonly used in previous empirical research (or the interwar sample used in Crafts and Mills (2013)), as it includes episodes of large variations in government spending, wide fluctuations in unemployment, and different periods with interest rates near the zero lower bound. Using the new quarterly series, I investigate whether government spending multiplier differs across slack states and monetary policy regimes in the United Kingdom.

As in Owyang et al. (2013) and Ramey and Zubairy (2014), multiplier estimates are obtained through state-dependent models using Jordà's (2005) local projection method. I estimate multipliers that are below unity irrespective of the amount of slack in the economy or the monetary policy regime; most estimates are between 0.3 and 0.8. Overall, there is some evidence that multipliers are significantly higher during periods of high unemployment in the U.K. but no evidence of larger multipliers at or near the zero lower bound. The paper proceeds as follows: Section 2 describes the data and considers the motivations and challenges of constructing and using the historical sample for the United Kingdom; Section 3 describes the econometric methodology and key issues in estimating multipliers; Section 4 presents the baseline estimates for multipliers across states of economic slack and robustness checks to the baseline specification; Section 5 does the same for multipliers across monetary policy regimes; Section 6 concludes.

2 Data

In this section, I discuss the advantages and challenges involved in using historical data for the United Kingdom to estimate government spending multipliers, which is followed by a brief description of the data construction process.

2.1 Advantages and Challenges of Using Historical Data

Since it is impossible to conduct randomized control trials across countries to measure the effect of changes in government spending, researchers have to resort to identifying "natural experiments" in aggregate historical data, where large, exogenous changes in government spending allows for the extraction of its effect on the economy from the many other contemporaneous confounding shocks. As discussed in Ramey and Zubairy (2014), this becomes even more challenging when a state-specific investigation is involved, as it requires a significantly large sub-sample containing exogenous shocks to spending.

To overcome this challenge, historical data for the U.K. is constructed dating back to 1910, which includes several periods of economic slack with deep recessions and high unemployment, and two prolonged periods of interest rates at or near the zero lower bound. Using data covering most of the 20th century also accounts for the two largest increases in

government spending in the history of the United Kingdom as a result of both world wars. A valid question, however, is whether the estimates using historical samples offer informative conclusions for modern policy: if the U.K. economy has changed significantly over time, estimates for government spending multipliers using data for the entire 20th Century are perhaps not indicative of what multipliers have been in recent years. Ramey and Zubairy (2014) respond to this issue by arguing that if multipliers were to have changed over time, they would intuitively be smaller, not larger, as better financial market access and greater consumer sophistication have led to less hand-to-mouth consumers (i.e. consumers who do not save or borrow), and thus a lower overall marginal propensity to consume. Additionally, monetary and fiscal stances are fairly well distributed across the entire sample for the U.K., with episodes of high, deficit-financed government spending and periods at the zero lower bound in both pre-WWII and post-WWII years and therefore it cannot be argued that there have been significant changes in policy methods and prescriptions over time.

Another potential problem with using historical data including WWI and WWII is the abnormality of economic characteristics in these periods, with rationing in private consumption and industrial production fully geared towards the war effort, which may add confounding factors to the estimation of multipliers. Figure 2 illustrates the behavior of variables of interest over WWI, WWII and the Korean War. While all of these periods had very low unemployment rates due to high industrial activity, both WWII and the Korean War occurred in periods where interest rates were near the zero lower bound, as illustrated by the shaded area in the graphs for defense news shocks. The co-movement of government spending and private activity suggest mixed behavior: while private activity increases with a lag after an increase in government spending in WWI, it seems to be moving in opposite directions to government spending for a large part of WWII, implying a partial crowding out of private activity by government spending. It is hard to draw any conclusions from observing this data, however, given the aforementioned potentially confounding characteristics of rationing and war-driven industrial production, which are controlled for in the robustness checks to the baseline results. This does not mean, however, that war periods do not offer valuable information, as they provide examples of large, exogenous shocks to government spending that are unavailable in "normal" years.²

A final issue regarding the baseline data used in this study relates to whether defense spending affects economic activity the same way as non-defense spending. To be able to account for this and test the validity of the results obtained from defense news shocks, I also estimate multipliers using the Blanchard and Perotti (2002) identification method, as is done in Ramey and Zubairy (2014). The Blanchard and Perotti (BP) shock is constructed directly from the government spending series, assuming that government spending does not respond contemporaneously to other macroeconomic variables.³

2.2 Data Description

In order to identify shocks to government spending that are both exogenous to the state of the economy and unanticipated by the public, I use the narrative method employed by Ramey (2011) and later updated in Ramey (2016), to create a series capturing changes in expectations regarding government spending for the United Kingdom. This is done by analyzing news sources – namely, *The Economist, The Times*, and *The Financial Times*⁴ – for the entire period covered

 $^{^{2}}$ Friedman (1952) provides a comprehensive discussion of why empirical macroeconomic studies should consider the valuable data provided by war episodes.

³ The shock is identified from a Cholesky decomposition in a VAR. A potential problem is that the shock identification scheme is prone to measurement errors in the government spending series. This is not an issue when using the defense news method.

⁴ The Times and The Financial Times have been published daily and The Economist has been published weekly for the entire period covered.

(1910-2016). I only account for changes in government spending that occur as a result of political or military events (i.e. election outcomes, wars, changes in the geopolitical scenario, etc.) as they are seemingly unrelated to the state of the economy. The underlying narrative used to create the series, as well as all of the identifications and computations of quarterly shocks are available in Fritsch (2017).⁵ The actual shock used in the series is defined as the nominal changes in expected present value divided by one-quarter lag of the GDP deflator multiplied by trend (potential) real GDP. The real GDP time trend is estimated using a sixth degree polynomial for the logarithm of GDP, as in Ramey and Zubairy (2014) and similarly to the method used by Gordon and Krenn (2010).

For the remaining variables used in the econometric estimation, I construct quarterly historical data for the entire period covered (1910 – 2016) by joining published quarterly series since 1946 by the Office for National Statistics (ONS) to annual data from several different sources, mostly compiled by the *Bank of England: Three Centuries of Macroeconomic Data* database. These are converted to quarterly frequency either by linear interpolation, or by other interpolation methods such as the Boot-Feibes-Lisman method or the proportional Denton procedure.⁶ As in Ramey and Zubairy (2014), I choose to use data at the quarterly frequency in order to capture the more immediate reactions from economic agents to shocks in government spending and to account for sudden, abrupt changes in the state of the economy (e.g. 2008q4 and 2009q1). The historical dataset includes real GDP, the GDP deflator, government spending, tax receipts, population, the unemployment rate, and interest rates for the United Kingdom.

⁵ The paper with the narrative for the defense news series has also been submitted together with this paper.

⁶ The Boot-Feibes-Lisman method is a smoothing method used by the IMF and other institutions for the disaggregation of times series data. The proportional Denton procedure uses a higher frequency variable related to the variable of interest as an indicator to interpolate a lower frequency variable.

Data for annual real GDP from 1910 to 1948 is available in the *Bank of England: Three Centuries of Macroeconomic Data* database, which combines data from several different sources.⁷ The early annual series is interpolated using the Boot-Feibes-Lisman method. For the GDP deflator, annual values from 1910 to 1949 are computed using the real and nominal GDP series in the *Three Centuries of Macroeconomic Data* database, and interpolated using spliced monthly data for the Consumer Price Index⁸ with the proportional Denton procedure.

Real government spending is derived by dividing data for nominal spending by the GDP deflator. The quarterly series for nominal spending is obtained by interpolating the annual data from 1910 to 1945 available in the *Three Centuries of Macroeconomic Data* database using the Boot-Feibes-Lisman method. This is also done for nominal tax receipts. Figure 1 shows the logarithm of real per capita government spending and GDP over the entire sample. The vertical lines indicate major military events over the 20th century, which include WWI, WWII, the Korean War, the Falklands War, and the War on Terror after the September 11th attacks. The graph for log of real per capita government spending shows the massive effect of military buildups over both world wars, and thus highlights the aforementioned importance of including war episodes in the baseline sample.

Finally, monthly data for unemployment rate and the 3-month Treasury bill rate are obtained from the *Three Centuries of Macroeconomic Data* database and the Office for National Statistics (ONS), and converted to quarterly frequency by taking 3-month averages for each quarter. These two variables are used to define the different states in the baseline results. The baseline slack state is defined as a quarter in which the unemployment is above a threshold of

⁷ Solomou and Weale (1991) for 1910 to 1912, Mitchell (1988) for 1913 to 1919, and Sefton and Weale (1995) for 1920 to 1947. See Data Appendix for further detail.

⁸ Also compiled by the Bank of England database from different sources. See Data Appendix.

7%, which is the value used by the Bank of England in its forward guidance statements to indicate economic expansion or contraction in the U.K. Ramey and Zubairy (2016) use a threshold of 6.5% for the U.S., also based on established thresholds by the Federal Reserve. Figure 3 shows the overall series for defense news shocks and the unemployment rate, with the shaded areas indicating periods during which unemployment is above the 7% threshold. The figure indicates that the pre-WWII rearmament period during the 1930s and the beginning of WWII are important examples of large defense spending shocks over periods of economic slack, while most of the large shocks over both world wars and the Korean War, however, occur during times where the unemployment rate is low.

For the definition of ZLB states, I include extremely accommodative periods where the 3month Treasury bill rate is consistently at or below 1%. This results in two long ZLB periods in in the full sample: the first one from 1932q2 to 1951q4, and the second one from 2009q1 to 2016q4. Figure 6 shows the overall series for defense news shocks and the Treasury bill rate, with shaded areas indicating ZLB periods. All of the large shocks over the rearmament period of the 1930s, the Second World War, and the Korean War occur during times where interest rates were at or near the ZLB.

3 Econometric Methodology

In this section, I describe the econometric methodology employed and then offer a brief discussion of issues that have arisen in the empirical literature on how to estimate government spending multipliers.

3.1 Local Projections

To estimate state-dependent government spending multipliers, this paper uses Jordà's (2005) local projection method, which was initially done by Auerbach and Gorodnichenko (2013), followed by Owyang et al. (2013) and Ramey and Zubairy (2014). The Jordà method requires a series of regressions for each horizon h for each variable. The linear model is shown below:

(1)
$$x_{t+h} = \alpha_h + \psi_h(L)z_{t-1} + \beta_h shock_t + \varepsilon_{t+h}$$
, for h = 0, 1, 2, ...

In the linear specification, x is the variable of interest, z is a vector of control variables, ψ_h is a polynomial in the lag operator, and *shock* is the identified shock. For the baseline results, the shock used is the defense news variable scaled by trend GDP, and the vector of control variables, z, includes real per capita GDP and government spending, where both are also scaled by trend GDP. Lags of the news variable are also included in z to control for serial correlation. Alternative specifications in the results use the Blanchard-Perotti (BP) identification for government spending shocks, which is defined by government spending at time t, with the control vector including lags of government spending and real per capita GDP. The coefficient β_h is the response of x at time t + h to a shock at time t, which allows us to create impulse response functions from the series of β_h 's estimated from single regressions at successive horizons.

This method is easily adaptable to include state-dependence, as shown below:

(2)
$$x_{t+h} = I_{t-1} [\alpha_{A,h} + \psi_{A,h}(L) z_{t-1} + \beta_{A,h} shock_t] + (1 - I_{t-1}) [\alpha_{B,h} + \psi_{B,h}(L) z_{t-1} + \beta_{B,h} shock_t] + \varepsilon_{t+h}$$

In this state-dependent model, I is a dummy variable that indicates the state of the economy when the shock hits. Therefore, the coefficients for the shocks vary according to different states,

allowing us to estimate different impulse response functions for each state. As the leading of the dependent variable generates serial correlation in the error terms, Newey-West standard errors are used.

3.2 Issues in Estimating Multipliers

Owyang et al. (2013) and Ramey and Zubairy (2014) both offer a detailed discussion of the existing pitfalls in the current empirical literature regarding the calculation of multipliers. While this paper will not reproduce that discussion here⁹, there are two issues that are worth mentioning, as they govern the variable transformations used in this paper as well as the final estimates for the spending multipliers.

The first one involves converting elasticities from impulse response functions to actual government spending multipliers in specifications which use the log of variables such as real GDP and government spending. In many cases, this is done using a conversion factor Y/G which is the sample average of the ratio of GDP to government spending. However, Ramey and Zubairy (2014) show that this conversion factor may indeed vary significantly over a historical sample and lead to biases in estimating multipliers, as the same elasticity of output can yield higher multipliers solely due to a high Y/G factor. As done in Ramey and Zubairy (2014), this paper uses the Gordon and Krenn (2010) transformation in order to avoid this bias. The transformation scales regression variables by an estimate of trend real GDP instead of taking the log of variables and allows multipliers to be estimated directly from impulse response functions.

A second issue concerns the definition of the multiplier in a dynamic setting. While several papers have used the definition by Blanchard and Perotti (2002) that multipliers are the

⁹ See Owyang et al. (2013) or Ramey and Zubairy (2014) for a complete discussion of these issues.

ratio of the *peak* of the output response to the *initial* government spending shock, others (e.g. Mountford and Uhlig (2009), Fisher and Peters (2010)) including Ramey and Zubairy (2014) argue that the multiplier should instead be defined as the cumulative output response divided by the cumulative government spending response (i.e. the integrals of both responses). This definition is the one used in this paper, which is estimated for the linear case using the equation below:

(3)
$$\sum_{j=0}^{h} y_{t+j} = \gamma_h + \phi_h(L) z_{t-1} + m_h \sum_{j=0}^{h} g_{t+j} + \omega_{t+h} \text{, for } h = 0, 1, 2, \dots$$

Here, $shock_t$ is an instrument for $\sum_{j=0}^{h} g_{t+j}$, where $\sum_{j=0}^{h} y_{t+j}$ is the sum of the GDP response from t to t + h and $\sum_{j=0}^{h} g_{t+j}$ is the sum of the government spending response from t to t + h. The cumulative multiplier at horizon h is therefore represented by m_h . This is also done for the state-dependent case:

(4)
$$\sum_{j=0}^{h} y_{t+j} = I_{t-1} \Big[\gamma_{A,h} + \phi_{A,h}(L) z_{t-1} + m_{A,h} \sum_{j=0}^{h} g_{t+j} \Big] + (1 - I_{t-1}) \Big[\gamma_{B,h} + \phi_{B,h}(L) z_{t-1} + m_{B,h} \sum_{j=0}^{h} g_{t+j} \Big] + \omega_{t+h} \text{, for } h = 0, 1, 2, \dots$$

Here, the instruments are $I_{t-1} \times shock_t$ and $(1 - I_{t-1}) \times shock_t$, i.e. the interactions of the shock variable with the indicator for each state. This produces the state-dependent cumulative multipliers, $m_{A,h}$ and $m_{B,h}$, which are used in the baseline results of this paper.

4 Multipliers in Periods of Economic Slack

The theoretical motivation for investigating whether multipliers are larger during periods of economic slack stems from the traditional Keynesian concept outlined in Keynes (1933) that deep recession periods with high unemployment see large government spending multipliers, as economic output is demand-driven and therefore a government spending stimulus will also stimulate private activity. While New Keynesian DSGE models indicate that the multipliers may be larger when interest rates are near the zero lower bound, they do not indicate higher multipliers in deep recessions.

Although several indicators are eligible as a measure of economic slack, this paper uses the unemployment rate as its baseline indicator, as done in the previous literature, as it is a generally accepted measure of resource idleness. For the baseline results, an unemployment threshold of 7% is used to distinguish between slack and non-slack states.¹⁰ As previously discussed, Figure 3 shows how defense news shocks are distributed across slack and non-slack states defined by the 7% threshold. To check if the multiplier estimates are robust to this definition, different thresholds are used, including an 8% threshold and a time-varying threshold based on an HP filter of the unemployment rate.

As defense news shocks or Blanchard-Perotti shocks are used as instrumental variables for government spending to yield multiplier estimates, it is important to consider the relevance of these variables as instruments. Table 1 shows the first-stage F-statistics for different samples and states for the regression of the sum of real government spending from t to t+h on the shock(s) at t, which include all other controls from the second stage – i.e. lagged GDP, government spending, and the news variable. F-tests for the defense news shock at different states and samples are shown in Table 1. A rule-of-thumb for F-tests is that a first-stage F-statistic below 10 indicates that the instrument has low relevance (Staiger and Stock (1997). Considering both the full and the post-WWII samples, the F-statistics for the defense news variable are usually above 10 for the linear and state-dependent specifications. An important exception is the slack

¹⁰ This is the threshold most recently used by the Bank of England for forward guidance in policy.

state in the post-WWII sample, where the F-statistic is below 1. This is similar to the results for relevance of the defense news instrument for the U.S. and Canada in Owyang et al. (2013), and suggest that the news variable is not very informative to estimate difference in multipliers across slack states in the post-WWII period. This supports the initial conjecture in Ramey and Zubairy (2014) that the post-WWII sample is not sufficiently rich to be able to distinguish between multipliers across different states using defense shocks.

4.1 **Baseline Results**

The main results for estimates of cumulative multipliers using the full historical sample for both the linear model and across slack states are presented on Table 2, for both 2 and 4 year horizons. As previously discussed, the cumulative estimates are constructed by calculating $\frac{\sum_{i=1}^{M} \Delta Y_i}{\sum_{i=1}^{M} \Delta G_i}$ for M = 8 and 16, where M represent quarterly horizons.

Initially considering the linear model, cumulative multiplier estimates are significantly below unity both at 2 and 4-year horizons for both identification schemes. The responses of government spending and GDP to a defense news shock of 1% are shown in Figure 4. The bands around the IRFs are 95 per cent confidence bands based on Newey-West standard errors. After a shock to defense news, output and government spending begin to rise, with government spending peaking at 7 quarters, and GDP peaking around 10 quarters after the shock.

Figure 4 shows how government spending and GDP respond to a defense news shock under different slack states. Similar to previous studies, I find that output responds more robustly to a spending shock during high unemployment periods. However, this does not imply larger multipliers as government spending also has a much stronger response in slack periods. Indeed, the state-dependent cumulative estimates in Table 2 also show multipliers below unity for all cases, with slightly higher estimates for the low unemployment period, although these are not significantly different form the estimates for high unemployment states, as shown by the HAC-robust p-values for differences in multipliers across states.¹¹ The same is also true for estimates using Blanchard-Perotti shocks. Therefore, the baseline results do not show evidence of higher multipliers in periods of high unemployment.

4.2 Robustness checks

Other specifications are carried out to test the robustness of the baseline estimates to the choice of threshold and sample, similar to those done by Ramey and Zubairy (2014).

I first consider a time-varying threshold of unemployment obtained by the trend of a Hodrick-Prescott filtered unemployment rate with a high smoothing parameter of $\lambda =$ 1,000,000, as shown in Figure 5. The trend for the HP filter does not account for data between 1920 and 1940 as unemployment was unusually high, and thus linearly interpolate the trends from before and after this period. Using a time-varying threshold accounts for changes in the structural rate of unemployment, which more accurately measures the relative amount of slack in the economy over time than a fixed threshold. The results for this specification are shown in Table 3. The estimates using defense news shock indicate significantly different multipliers between states, where higher multipliers in high unemployment periods at the 2 year horizon. This is not the case at the 4-year horizon, and while the estimate for the slack state is above 1, it is not significantly different for defense news shocks, as BP shocks show similar results to the baseline specification.

¹¹ HAC-robust p-values below 0.1 indicate a statistically significant difference between multipliers.

Another check for whether the results are robust to the choice of threshold is done by simply raising the fixed unemployment threshold to 8%. This specification yields very similar results to that of the baseline estimates, also shown in Table 3, indicating no significant difference between multipliers across slack states and estimating multipliers below unity across all states and shock identification methods.

Finally, Table 3 shows estimates using a threshold based on the 7quarter moving average of output growth, instead of the unemployment rate. This is originally done in Auerbach and Gorodnichenko (2012) to estimate state-dependence based on recessions and expansions, and is used as a robustness check in Ramey and Zubairy (2014). The results show multipliers below unity across all states and specifications, but show significantly higher multipliers for recession periods when using the defense news shock as the instrument. The BP shock does not produce significantly different multipliers across states.

In Table 4, further alternative specifications on slack states are investigated by adding controls or restricting the full historical sample. The first specification includes an additional control for taxes, as it is important to consider how tax policy differs across states in order to understand multiplier results.¹² The baseline results are fairly robust to the addition of taxes as a control variable, as they yield fairly similar results to the baseline specification.

Finally, multipliers are estimated using two sample restrictions: excluding the rationing periods in WWI and WWII, and on the subsample for the post-WWII periods. Both specifications yield multipliers that are not significantly different across states and while some

¹² Romer and Romer (2010) estimates tax effects on output, and produce very significant negative multipliers on taxes, on the order of -2 to -3.

estimates are above unity, these have very large standard errors and are not significantly higher than 1.

As a whole, the results for multipliers across slack states suggest that while the baseline results do not show any evidence of higher multipliers at high unemployment periods, some alternative specifications using different thresholds to define slack – i.e. the time-varying unemployment threshold and the 7-quarter moving average of output growth – suggest significantly higher multipliers in slack periods.

5 Multipliers at the Zero Lower Bound

Differently than for slack states, the theoretical literature using New Keynesian models suggest that government spending multipliers are indeed higher when interest rates are at or near the zero lower bound (e.g. Christiano et al. (2011)). The intuition for this is that a deficit-financed increase in government spending raises inflation expectations. When nominal interest rates are held constant, as is the case at the ZLB, the increase in expected inflation drives the real interest rate down, therefore stimulating the economy.

Considering the full sample, the historical data for the U.K. contains two prolonged periods at the ZLB, as shown in Figure 6, with large shocks to spending when considering the defense news variable, as the rearmament program of the 1930s, the Second World War, and the Korean War all occurred at ZLB periods. The relevance of the defense news shock as an instrument for changes in government spending over ZLB states is shown in Table 1, with an F-statistic greater than 10 both for ZLB and non-ZLB states.

5.1 **Baseline Results**

The baseline results for state dependent multipliers across monetary policy regimes are shown on Table 5 and the individual responses by government spending and GDP to a news shock under ZLB and non-ZLB periods are shown in Figure 7. The graphs show that government spending reacts more persistently to a news shock under ZLB periods, while the response for GDP is mixed and not significantly different.

The cumulative estimates on Table 5 show multipliers below unity for all specifications, states, and horizons, and, overall, indicate that multipliers are not significantly higher when the interest rate is at or near the zero lower bound. The results using defense news shock as the instrument actually yield significantly higher multipliers for normal periods at the 2-year horizon, while estimates for the 4-year horizon are not significantly different. This is fairly odd and unexpected. The preliminary results on ZLB-dependence for U.S. multipliers in Owyang et al. (2013) also finds higher multipliers for normal periods at the 4-year horizon. However, I do not take a hard conclusion from this, and just assume that it suggests that multipliers at ZLB periods are not significantly higher.

5.2 Robustness

While many robustness checks were carried out on these specifications, this paper only shows an additional specification adding controls for taxes and inflation, in order to consider the role of financing on the multiplier. The results are similar to the baseline, with the estimates at the 2-year horizon for defense news shocks suggesting a higher multiplier at normal periods. Again, what I conclude from these results is that there is no evidence of higher multipliers at periods where interest rates are at or near the zero lower bound. The results suggesting higher multipliers for normal periods are not robust enough to lead to a significant conclusion.

6 Conclusion

In this paper, I attempted to expand the small literature on the state-dependence of government spending multipliers, by using newly constructed news shocks for the United Kingdom to estimate whether multipliers are larger during periods of economic slack or when interest rates are at the zero lower bound. The data spans more than 100 years in order to cover large variations in spending and economic states. The baseline estimates for multipliers across different states are tested against alternative specifications to test their robustness.

The results indicate that while the baseline estimates for multipliers across slack states find no evidence of significantly higher multipliers at high unemployment periods, alternative specifications which use different thresholds and slack definitions suggest a significantly higher multiplier when the unemployment is high or when the economy is in a recession. Therefore, taken as a whole, the results suggest *some* evidence of higher multipliers in slack states, although these are not consistent. Additionally, the multipliers across different monetary policy regimes suggest that multipliers are not significantly higher at or near the zero lower bound. Finally, multiplier estimates are below unity for all specifications, horizons, and states, ranging from 0.3 to 0.9. All of the cases where the multipliers are above unity result from estimates having large standard errors, meaning that the results are not significantly higher than 1.

These results therefore add to the literature on state-dependent multipliers and shows that there is no consistent evidence for state-dependence in government spending multipliers, although some evidence suggests that it may be true in periods of economic slack.

Data Appendix

GDP:

1955-2016: Quarterly data for real GDP at 2013 prices (ONS Series ID: ABMI). *Source:* Office for National Statistics (ONS).

1910-1954: Annual data for real GDP at 2013 prices compiled by Bank of England: Three Centuries of Macroeconomic Data. The project extends the ONS GDP series back to 1700 using the following sources (for the scope of this paper):

1910 – 1912: Solomou and Weale (1991): Balanced estimate of GDP for 1870-1913, £mn 1900 constant factor cost, Table 3.

1913-1919: Mitchell (1988): Feinstein's GDP at factor cost, "Compromise estimate' 1855-1920, (1913=100), page 836.

1920-1947: Sefton and Weale (1995): Balanced GDP at market prices, 1920-1990, £mn 1938 constant prices. Table A.3, pages 188-189.

1948-1954: Office for National Statistics (ONS): Real GDP at market prices, 2013 reference year prices (Series ID: ABMI).

Data adjustment: Since the quarterly data before 1955 was only available from 1920 to 1938, I decided to simply interpolate the annual data from 1910 to 1954 to quarterly data using the Boot-Feibes-Lisman method.

GDP deflator:

1955 – 2016: Quarterly data available from real GDP at 2013 prices (ONS Series ID: ABMI) and nominal GDP (ONS Series ID: YBHA). GDP deflator = nominal GDP / real GDP. *Source:* Office for National Statistics (ONS).

1914 – 1954: Spliced monthly data for Consumer Price Index (2015=100), compiled by Bank of England: Three Centuries of Macroeconomic Data. ONS CPI series extended back to 1914 using the following sources (for the scope of this paper):

July 1914 – Dec. 1918 & Dec. 1939 – May 1947: Monthly cost of living index, 1914-1947. Office for National Statistics (ONS). (July 1914=100)

Jan. 1919 – Nov. 1939: Capie and Collins (1983): Ministry of Labour Retail Price Index: Cost of living (1924=100). Table 2.13.

June 1947 – Dec. 1948: Monthly Retail Price Index, 1947 – 2015. Office for National Statistics (ONS) (January 1974=100).

Jan. 1949 – Dec. 1954: Monthly Consumer Price Index. Office for National Statistics (ONS) (2015 = 100).

1910 – 1955: Annual data available from the real and nominal GDP series in Bank of England: Three Centuries of Macroeconomic Data.

Data adjustment: From 1910-1914, the annual data was linearly interpolated to quarterly. For 1914 – 1954, I converted the monthly CPI data to quarterly by taking 3-month averages and used it to interpolate the annual GDP deflator using the proportional Denton procedure, through 1955. The pre-1955 data was multiplied by the ratio of the ONS series in 1955 to the historical data in 1955.

Potential GDP:

The real GDP time trend is estimated as a sixth degree polynomial for the logarithm of GDP, as done in Ramey and Zubairy (2014).

Defense news:

The narrative underlying the defense news shock series is available in Fritsch (2017).

Population:

1971-2016: Annual data, mid-year estimate, released on June of each year. *Source:* Office for National Statistics (ONS).

1910-1970: Annual data, extending back the ONS series. Excludes population of S. Ireland from 1910 to 1920. *Source:* Global Financial Data.

Data adjustment: Annual data was interpolated to obtain monthly series, assigning annual value to June. The series was then converted to quarterly frequency by taking the averages of the monthly values.

Government Spending:

1946-2016: Quarterly data for General Government: Current spending on goods and services (ONS Series ID: GZSN). *Source:* Office for National Statistics (ONS).

1910-1945: Annual data for government current spending on goods and services. *Source:* Middleton (1996), available in Bank of England: Three Centuries of Macroeconomic Data.

Data adjustment: Annual data from 1910 to 1946 is interpolated to quarterly data using the Boot-Feibes-Lisman method.

Tax Revenues:

1946 – 2016: Quarterly data for Total Current Receipts (ONS Series ID: ANBT). Source: Office for National Statistics (ONS).

1910 – 1945: Annual data for total government receipts. *Source:* Middleton (1996), available in Bank of England: Three Centuries of Macroeconomic Data.

Data adjustment: Annual data from 1910 to 1945 is interpolated to quarterly data using the Boot-Feibes-Lisman method.

Interest rate:

1963-2016: Monthly data for 3-month Treasury bill yield (ONS Series ID: AJNB). *Source:* Office for National Statistics/Bank of England.

1910-1962: Monthly 3-month Treasury bill yield. *Source:* Capie and Webber (1985), Table 111.10, page 505, available in Bank of England: Three Centuries of Macroeconomic Data.

Data adjustment: Series is spliced in BoE database. Quarterly series is then constructed by taking the average of the three months for each quarter.

Unemployment rate:

Dec. 1975 – 2016: Monthly data for Unemployment Rate (Labour Force Survey) (ONS Series ID: MGSX). *Source:* Office for National Statistics (ONS).

1910 – Nov. 1975: Monthly data for unemployment rate, seasonally adjusted and interpolated in Bank of England: Three Centuries of Macroeconomic Data. *Source:* Denman and Macdonald (1996), Table 1 and 2, page.

Data adjustment: Series from 1910 - 1975 is seasonally adjusted and interpolated in the BoE database, and spliced to the ONS monthly series. Quarterly series is then constructed by taking the average of the three months for each quarter.

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	F-statistic	Number of observations
Defense news shock		
Full sample		
1910q1 - 2016q	11.70	428
1910q1 – 2016q - Slack	26.78	162
1910q1 – 2016q – No slack	8.14	266
1910q1 – 2016q - ZLB	14.96	111
1910q1 – 2016q – Normal	11.72	317
Post – WWII sample		
1947q1 - 2016q	21.80	280
1947q1 – 2016q - Slack	0.74	77
1947q1 – 2016q – No slack	18.01	203

Table 1: Tests of Instrument Relevance

Note: The F-tests are the joint significance of the defense news shocks for a regression of the sum of government spending through a horizon of 20 quarters on the shock at time *t* and all other controls from the second stage. These are done both for the full sample of 1910q1 - 2016q4 and for the post-WWII sample of 1947q1 - 2016q4.

	Linear Model	High Unemployment	Low Unemployment	P-value for difference in multipliers across states
Defense news shock				
2 year integral	0.51 (0.11)	0.46 (0.044)	0.53 (0.17)	0.648
4 year integral	0.60 (0.20)	0.53 (0.051)	0.63 (0.30)	0.729
Blanchard-Perotti shock				
2 year integral	0.40 (0.040)	0.46 (0.042)	0.39 (0.074)	0.402
4 year integral	0.45 (0.048)	0.52 (0.038)	0.43 (0.097)	0.423

Table 2. Baseline Estimates of Multipliers Across Slack States

Note: Standard errors are in parentheses under the multiplier values. The p-values are HAC-robust p-values.

	Linear Model	High Unemployment	Low Unemployment	
HP filtered time-varying thr	eshold ($\lambda = 10^6$)			
Defense news shock				
2 year integral	0.51	0.93	0.36*	
4 year integral	0.60	1.67	0.43	
Blanchard-Perotti shock				
2 year integral	0.40	0.44	0.36	
4 year integral	0.45	0.51	0.43	
8% unemployment rate three	shold			
Defense news shock				
2 year integral	0.51	0.41	0.53	
4 year integral	0.60	0.34	0.64	
Blanchard-Perotti shock				
2 year integral	0.40	0.46	0.39	
4 year integral	0.45	0.52	0.44	
	Linear Model	Recession	Expansion	
7 quarter moving average of output growth weighting function				
Defense news shock				
2 year integral	0.51	0.57	0.38*	
4 year integral	0.60	0.83	0.40*	
Blanchard-Perotti shock				
2 year integral	0.40	0.33	0.41	
4 year integral	0.45	0.45	0.44	

Table 3. Robustness Checks: Estimates of Multipliers Across Slack States

Note: If the last entry is marked with *, it indicates that the HAC-robust p-value for difference in multipliers, $p_{HAC} < 0.1$.

	Linear Model	High Unemployment	Low Unemployment
Additional control for taxes			
Defense news shock			
2 year integral	0.45	0.47	0.45
4 year integral	0.51	0.54	0.51
Blanchard-Perotti shock			
2 year integral	0.40	0.49	0.39
4 year integral	0.46	0.55	0.43
Excluding rationing periods	in WWI and WW	ΊΙ	
Defense news shock			
2 year integral	0.56	1.53	0.46
4 year integral	-3.03	1.82	0.27
Blanchard-Perotti shock			
2 year integral	0.55	0.78	0.45
4 year integral	0.57	0.80	0.56
Subsample: 1947 – 2016			
Defense news shock			
2 year integral	-0.55	-16.88	-0.47
4 year integral	-0.66	-8.77	-0.34
Blanchard-Perotti shock			
2 year integral	0.26	1.58	0.15
4 year integral	0.32	3.49	0.19

Table 4. Robustness Checks: Estimates of Multipliers Across Slack States

Note: If the last entry is marked with *, it indicates that the HAC-robust p-value for difference in multipliers, $p_{HAC} < 0.1$.

	Linear Model	Near Zero Lower Bound	Normal	P-value for difference in multipliers across states
Defense news shock				
2 year integral	0.51 (0.11)	0.31 (0.13)	0.77 (0.19)	0.0639
4 year integral	0.60 (0.20)	0.35 (0.091)	1.79 (1.38)	0.242
Blanchard-Perotti shock				
2 year integral	0.40 (0.040)	0.27 (0.057)	0.47 (0.069)	0.0249
4 year integral	0.45 (0.048)	0.30 (0.085)	0.54 (0.072)	0.0293

Table 5. Baseline Estimates of Multipliers Across Monetary Policy Regimes

Note: Standard errors are in parentheses under the multiplier values. The p-values are HAC-robust p-values.

	Linear Model	Near Zero Lower	Normal
		Bound	
Additional control for taxes	and inflation		
Defense news shock			
2 year integral	0.47	0.27	0.80*
4 year integral	0.53	0.33	4.54
Blanchard-Perotti shock			
2 year integral	0.42	0.36	0.49
4 year integral	0.47	0.49	0.55

Table 6. Robustness Checks: Estimates of Multipliers Across Monetary Policy Regimes

Note: If the last entry is marked with *, it indicates that the HAC-robust p-value for difference in multipliers, $p_{HAC} < 0.1$.

Figure 1. Government Spending and GDP





Figure 2. Government spending, defense news shocks, and unemployment rate during wars



Figure 3. Defense spending news shocks and unemployment rate



Figure 4. Government spending and GDP responses to a news shock across slack states










Figure 7. Government spending and GDP responses to a news shock across monetary policy regimes

Defense News Shocks in the United Kingdom, 1910-2016: Estimates Based on News Sources

By Gabriel P. Fritsch

This paper documents the construction of a series for changes in expected present value of government spending for the United Kingdom from 1910 to 2016 due to political and/or military events, employing a narrative method similar to Ramey (2016). This is done by analyzing the news taken from The Times, The Economist, and the Financial Times which has been published daily or weekly for the entire period covered. Periodical sources are useful to gauge shifts in expectation regarding such events, and government sources (i.e. Parliamentary papers) were used when data provided in periodicals was ambiguous. The text in red include my comments on the periodical sources and how they relate to shifting expectations, together with the present discounted value calculations for government spending shocks in specific quarters.

As in Ramey (2016), the constructed series is an approximation to the changes in expectations at the time, which requires many judgment calls and assumptions when incomplete or conflicting forecasts are involved. Present discounted values were calculated at a horizon of 5 years at most, except for a few examples where drastic changes in the medium-to-long-term scenario occur, such as the beginning of the Cold War with the war in Korea, and the fall of the Berlin Wall. Even for these examples, however, the horizon does not exceed 10 years. The discount rates used for calculations are the prevailing 3-year Treasury bond rate for a quarter. If the shock occurred in the last two weeks of a quarter, it is dated as the following quarter as it does not have a considerable effect on the aggregate for the entire quarter.

The following formula is used in several cases: $\sum_{i=0}^{T} \left(\frac{1}{1+i}\right)^i = \frac{1+i}{i} \left[1 - \left(\frac{1}{1+i}\right)^{T+1}\right]$

Abbreviation guide:

- TE: The Economist
- TT: The Times
- FT: Financial Times
- CoE: Chancellor of the Exchequer
- PM: Prime Minister
- RAF: Royal Air Force
- MP: Member of Parliament
- WP: White Paper (i.e. Policy paper by Cabinet)
- HoC: House of Commons
- MoD: Minister of Defence/Ministry of Defence
- FY: Financial/fiscal year

March 5, 1910: Supplementary Naval Estimates of £689,100: "No doubt it is the Dreadnought policy, coupled with the commerce-destroying policy, that is responsible for the enormous and ever-increasing sacrifices in which we are now involved, but for the moment our statesmen seem to have lost entirely those habits of financial prudence which were an instinct with an older generation". (TE, pg. 492)

Army Estimates for FY 1910-11 also show an increase of £325,000 on the estimates for 1909-10 due to an increase of the Regular Army and the cost of volunteers. (TE, pg. 491)

March 12, 1910: Naval estimates for FY 1910-11 at £40.6 million. The Economist comments on how high this is, mentioning that the budget was half this size fifteen years earlier and that the press is "staggered at the size of the Estimates". This is a £5.5 million increase over the estimates for 1909-10. (TE, pg. 544)

Defense news shock: naval arms race underway

1910Q1: PDV = 5.5 + 0.325 + 0.689 = £6.514 million

July 16, 1910: On the naval race between the UK and Germany, The Economist comments: "We cannot go on adding five millions a year to our Naval Estimates - a sum which represents more than one-fourth of the interest on the whole national debt". (TE, pg. 102)

February 11, 1911: Forecast by Mr. Archibald Huld that Naval estimates for 1911-12 will be "between 4 and 5 millions higher than last year". (TE, pg. 255)

February 25, 1911: The Army Estimates, which "should have shown a substantial decrease" in 1911-12, actually increased due to the demands of Richard Haldane, Secretary of State for War: "He demands increased grants of no less than £200,000 a year; he also asks the extraordinary sum of £80,000 for special expenditure in connection with the Coronation". (TE, pg. 367)

March 4, 1911: "It is rather a striking comment upon the difficulties of public journalism in this country that practically all the newspapers of the United Kingdom announced a reduction of the Army estimates by $\pounds70,000$, although, in fact, there is a real increase of $\pounds230,000$ in the expenditure, as well as an addition to the National Debt through the revival of some unexhausted borrowing powers under one of the Military Works Loans Acts". (TE, pg. 426)

March 11, 1911: Naval Estimates for 1911-12 are at £44.39 million, which is £3.8 million above the estimate for 1910-11. This is slightly below the forecast by Archibald Huld. (TE, pg. 488)

March 18, 1911: "And we shall be more pleased than surprised if the mere mooting of the project does not pave the way to substantial arrangements for a mutual reduction of naval expenditure between London and Berlin. Not merely the taxpayers, high and low, but social reformers in both countries, resent the growing financial strain which is involved in the fact that Great Britain and Germany have been building more or larger ships every year, each in the hope of increasing its navy at a more rapid ratio than the other". (TE, pg. 546)

Defense news shock: Army estimate saw real increase of £230,000 when a decrease was expected. Navy estimates increased by £3.8 million.

1911Q1: PDV = 0.23 + 3.8 = £4.03 million

May 20, 1911: "On the subject of naval expenditure, Mr. Lloyd George (Chancellor of the Exchequer) was more or less reassuring, and he evidently counts on substantial reductions next year and the year after". (TE, pg. 1054)

July 8, 1911: "The Admiralty, having sold the old ones for nothing, is now spending immense sums on a new programme of cruisers, and Mr. Lee asks that this programme should be enlarged. He was delighted to find that the Foreign Secretary, and he might have added Mr. McKenna [First Lord of the Admiralty], hold out no suggestion that the ratification of the Declaration of London will relieve our naval expenditure. It is 'comforting', he remarked, to know the view of the Foreign Secretary, 'and, indeed, it may be said with truth than an increase of naval strength will be necessary'. [...] Lord Charles said that after the Declaration of London 'the very least we could lay down would be 60 cruisers.' He said nothing about the cost, but, taking the price at half-a-million apiece, probably a very modest estimate, and the time at two years, this would mean 15 millions a year. In other respects Lord Charles said that out of 68 millions sterling which he wanted to be spent, only 37 millions had yet been spent, and yet in three years Mr. McKenna has raised the naval estimates by 12 millions sterling. It looks as if the increase would have been at least 30 millions sterling if Lord Charles had had his way [...] Lord Charles was also of opinion that we have not enough torpedo boats and destroyers, and he wishes to have 'a proportion as against Germany of 3 to 1, in boats suitable for the North Sea'. This may mean that we should have to spent £3 to every £1 spent by Germany, which would involve an addition probably of about 20 millions a year to the naval estimates".

(TE, pg. 59)

October 14, 1911: "Why should not Great Britain and Germany agree to go back to the [naval] expenditure of 1909-10 in their forthcoming budgets? This would enable us to reduce the income-tax and repeal the sugar duties". (TE, pg. 753)

March 2, 1912: "[Lord Haldane, Secretary of State for War] admitted that for a time, until the force was thoroughly established, the anticipated savings could not be realised and it will be found that for several years there have been substantial additions to the charge for the Territorial Force, which have not been balanced by savings in other directions. Now that this force has been raised to a state of efficiency, of which Lord Haldane and his staff are justly proud, we might surely have expected a serious attempt to realise these old promises. Instead of that, we find in the memorandum that the Army Estimates for 1912-13 show an increase of £170,000 on those for the previous year, and amount to no less a sum than $\pounds 27,860,000$ ". (TE, pg. 455)

March 16, 1912: Naval estimates slightly less than last year, but about the same. Framed assuming that other naval powers are not increasing their naval programs. If they do, supplementary estimates will be needed. (TE, pg. 566)

Assume the small increase in Army expenditure and decrease in Naval expenditure cancels out. No news for 1912Q1.

May 18, 1912: Winston Churchill, as the new First Lord of the Admiralty, announces that he intends to present supplementary estimates due to the new German Navy Bill. The Economist criticizes this decision: "The sooner the British public recognises that Mr. Churchill is doing mischief the less mischief he will be able to do". (TE, pg. 1060)

July 19, 1912: Supplementary estimate for the Navy for 1912-13 announced at £990,000. For Army, supplementary spending of £248,000. (TT, pg. 6)

Defense news shock: increased naval spending as a response to the German Navy Bill. Assign shock to 1912Q2 as the supplementary estimate was announced in May.

1912Q2: PDV = 0.99 + 0.248 = £1.238 million

December 14, 1912: Malaya and Canada, both British colonies, offer four super-dreadnoughts to the UK in contribution to the naval program. The maintenance of the ships will be bore by the UK, each costing \pounds 127,000 a year. Churchill says that these contributions "shall bring no relief to the British taxpayer. It is a contribution not to relieve taxes but to enlarge expenditure. It is to increase the fleet beyond the agreed margin - a stimulus and incentive to that naval competition which the Prime Minister and his colleagues so deeply deplore". Another article says that these ships will only be obsolete in 10-15 years. (TE, pg. 1214)

Defense news shock: £508,000 a year for, say, 12 years for additional super-Dreadnoughts.

$1912Q4: PDV = 0.508*(1/0.0304)*[1-(1/1.0304)^{12}] = \text{\pounds}5.044 \text{ million}$

January 11, 1913: "Several statements have appeared in the *Daily Telegraph* recently to the effect that the Naval Estimates, which now stand at 44 millions odd, are to be raised to 50 millions within the ensuing year". (TE, pg. 70)

February 1, 1913: "Now that Germany is laying down two battleships only, a substantial reduction of the Navy estimates should be looked for, especially as Anglo-German relations have happily become so friendly and intimate. The statement made so authoritatively by the *Daily Telegraph* of another huge expansion in naval armaments is now regarded with scepticism, but *The Times* talks them up to 47 millions, and actually hints that five battleships are to be laid down to the German two". (TE, pg. 210)

March 15, 1913: The new Navy estimates amount to \pounds 44.3 million, which exceeds that of 1912-13 by \pounds 1.233 million. The Economist calls it a "stupendous sum... another heavy addition to the burden of unproductive expenditure". (TE, pg. 639)

March 22, 1913: "The [Army] Estimates presented on Saturday show an increase of £360,000, a very serious additional burden on the taxpayer, or a still more serious and impolitic reduction of the Sinking Fund just when our finances need support". (TE, pg. 693)

On Naval spending: "...the average rate of increase, therefore, works out at the alarming figure of nearly £3,000,000 per annum. [...] growth is almost as rapid as ever. [...] the prospect for the future much more promising, unless the economists in the House of Commons will take the trouble to make effective criticisms, and divide against excessive votes. They should seek to fulfil the letter and spirit of the new understanding with Germany, to work in accordance with the reduced construction of battleships in Germany, to develop a system of reserve crews, and to abandon the absurdly wasteful and dangerous system of keeping everything on a "ready for instant war" basis in time of peace [...] That a financial purist like the Prime Minister should allow indefinite *promises* of supplementary Estimates to be embodied in the Estimates themselves passes our understanding". (TE, pg. 694)

March 29, 1913: Winston Churchill, First Lord of the Admiralty, fears that "there is no prospect of avoiding large and continuous increases in naval armaments in future years, unless the period of acute rivalries and rapid scientific expansion comes to an end". (TE, pg. 742)

Defense news shock: Naval spending increase of $\pounds 1.233$ million, Army spending increase of $\pounds 360,000$. Given Churchill's statements, naval spending can also be forecasted for the next five years, with a spending increase of $\pounds 3$ million a year.

tava spending					
FY	1913-14	1914-15	1915-16	1916-17	1917-18
Mar. 1913	£46.3m	£49.3m	£52.3m	£55.3m	£58.3m

Naval spending

$1913Q1: PDV = 1.233 + 0.36 + 3*(1/0.0309)*[1-(1/1.0309)^{5})] = 1.233 + 0.36 + 13.704 = \text{\pounds}15.3 \text{ million}$

July 5, 1913: "The *Daily Chronicle* informs us that the Admiralty hopes to raise next year's naval expenditure to 50 millions". (TE, pg. 14)

November 15, 1913: Churchill announces that "provisions must be made for more money by means of supplementary votes"; "Mr Churchill, with an insolence which foreigners appreciate and resent, has added a programme of supremacy in the air in addition to supremacy at sea; and his speech at the Guildhall is taken by many to indicate his intention of returning to his old party if they are prepared to have him". (TE, pg. 1065)

December 27, 1913: In its Christmas outlook, The Economists offers a rosy view: "There is at least cause for undiluted satisfaction in the friendly tone which has been given to our diplomatic relations with Germany, and the fact that the German Admiralty has reduced its programme of construction from four to two battleships makes it perfectly easy for the British Government, if it has the will, to reduce our naval expenditure. Not would it be impracticable now, with the help of the United States, to initiate a general movement for the limitation of armaments". (TE, pg. 1396)

January 17, 1914: "There are signs of a very marked concentration of feeling among businessmen all over the country that the coming Naval Estimates should be closely scrutinised, with a view to economy". (TE, pg. 112)

January 31, 1914: "The rumours of grave irregularities in the spending departments of the Navy, following upon the canteen scandal in the Army, have crystallised in a statement that the Admiralty will have spent by the end of the financial year from three to five millions above the sum authorised by Parliament". (TE, pg. 214)

February 28, 1914: Supplementary estimates for both Army and Navy. Navy spending in 1913-14 is £4.628 million above the original estimate and Army spending is £296,000 above its original estimate. (TE, pg. 520)

March 14, 1914: Navy estimate for 1914-15 of £51.55 million, £5.24 million higher than the original estimates for 1913-14. Churchill is heavily criticized by The Economist. (TE, pg. 647)

Army estimate for 1914-15 are £625,000 higher than the estimates for the previous year. A large share of this increase is due to a rise in aviation expenditure. (TE, pg. 649)

Defense news shock: Navy estimate higher than 1913 forecast. Army estimate also much higher.

1914Q1: PDV = 4.628 + 0.296 + 2.24/1.0309 + 0.625/1.0309 = £7.703 million

On June 28th, Archduke Franz Ferdinand, heir to the throne of Austria-Hungary is assassinated. Austria invades Serbia, which is followed by Germany's invasion of Belgium, Luxembourg, and France. UK declares war on Germany on August 4th. World War I begins.

November 18, 1914: Lloyd George presents War Budget. Extra cost of war to be met partly by loans and partly through higher taxation. Additional cost of the war for 1914-15 on the budget is of £328.443 million. There is no forecast of future spending beyond this financial year, only a comment by Lloyd George that the war could cost at least £450 million in the first full year (i.e. until August 1915).

Defense news shock: Beginning of World War I. Assume that the shock occurs after the UK declaration of war in August, so in 1914Q3. Given announcement by Lloyd George, I assume that the rest of the current financial year will see an increase of £450 million. Even after the Battle of the Marne in September, which established the stalemate on the Western front, there was a general sense in the articles that war would be short, so I assume expectations are still that the war will be over in less than a year. No data on 3-year Treasury rates for WWI, so use discount rate on War Loan of 3.5% for 1914-1918.

1914Q3: PDV = 450/1.035 = £434.8 million

January 9, 1915: "The Army and Navy, remarked Mr. Lloyd George, now amounts to £45,000,000 a month. This means about £1.5 millions per diem, and gives us for a full year of warfare a total of £550,000,000, or £100,000,000 more than the Chancellor estimated in his recent speech to the House of Commons". (TE, pg. 50)

February 27, 1915: "A White Paper issued today shows that a Supplementary Estimate of £37,000,000 is required in addition to the ordinary grants for the year ending March 31, 1915, making a total of £362,000,000 for war expenditure up to that date. A second White Paper shows that a further vote of £250,000,000 will be required towards defraying the expenses which may be incurred during the year ending March 31, 1916, and explains that it 'is intended to cover not only the cost of Navy and Army Services and warlike operations, but also all expenditure which may be necessary or desirable in view of the conditions created by the war". (TE, pg. 437)

March 6, 1915: "...the new vote of credit of £250,000,000 will, it is estimated, finance the war and all other expenditure to the end of the second week in July, a little over three months. The war, therefore, is growing increasingly costly. From April 1st the war will cost £1,700,000 a day, and the aggregate of Army and Navy services will have reached the figure of £1,900,000 a day. It is, in fact, said Mr Asquith (PM), necessary to calculate an establishment charge of two millions a day". (TE, pg. 475)

WWI defense spending forecasts

FY 1914-15	1915-16
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Nov. 1914	328.4m	121.6m
Feb. 1915	362m	221.6m
Mar. 1915	362m	268m

Defense news shock: spending much higher than previously anticipated. $\pounds 37m$ more for current FY and annual spending is estimated at $\pounds 2m^*365 = \pounds 730m$. So spending on 1915-16 is about $\pounds 250m$ higher.

1915Q1: PDV = 37 + (368 - 121.6)/1.035 = £275.1 million

May 8, 1915: "On the same assumption of a six months' war the Army will cost 400 millions, the Navy 120 millions, railway compensation and miscellaneous 18 millions, advances to Allies and colonies 100 millions - the last a prodigious total, which deserves some emphasis and more of explanation. Thus the votes of credit come to 638 millions, and the total Budget for the year, if the war last until the end of September, will be £790,458,000. On a second still more appalling assumption that it continues to the end of the financial year, i.e. until March 31, 1916, the advances to Allies and dominions are to be doubles, i.e. raised to 200 millions sterling; the Army is to cost 600 millions, and the Navy 146 millions. The total Budget would then be £1,132,654,000. The Chancellor of the Exchequer said nothing about the cost of military and naval pensions, which grows horrible with every casualty list. It will be a huge charge on revenue". (TE, pg. 889)

Defense news shock: war now is being assumed to last until September, with chances of being extended until March 1916. This updates estimates for 1915-16, putting it at £620m (Army plus Navy plus transfers to colonies and Allies). If the war carries on until the end of FY 1915-16, estimates are at 746m. I assume it expectations are already set that the war carries on until March 1916.

1915Q2: PDV = 946 - 268 = £678 million

September 18, 1915: "On Wednesday by way of preliminaries the Prime Minister moved the seventh Vote of Credit - this time for 250 millions sterling, which brings the total voted for war purposes to $\pounds 1,262,000,000$. The daily cost has risen steadily to $\pounds 3,500,000$ - and Mr Asquith offers no hope of a reduction, though there has been a slight decline in the cost of the Navy, which since June has stood at $\pounds 600,000$ a day. The Army has been costing $\pounds 2,000,000$ a day during the present month. The chief cause of increase is the loans to our Allies, which are to be repaid after the war". (TE, pg. 426)

September 25, 1915: New CoE (Reginald McKenna) presents second War Budget: "Mr Lloyd George's financial statement in May estimated [...] for the current financial year [...] the expenditure at $\pounds 1,133,000,000$, on the hypothesis that the war lasted until March 31st. Unfortunately, war estimates have been raised month by month; and on the same hypothesis Mr McKenna now puts the total expenditure of the country for the current year at $\pounds 1,590,000,000$ ". (TE, pg. 463)

Defense news shock: Assumption still is that war will last until March 1916, but cost has risen. Daily cost is now at £3.5m, with the chief cause of the increase being higher loans to Allies. This puts yearly war spending at £1277m. The updated budget announced by Lloyd George on Sept. 25th puts the total budget at £1590, and assuming a non-war government spending of £200m, this puts the annual war spending at around £1400m. Assumption/expectation remains that the war will be over by March 1916.

1915Q3: PDV = 1400 - 946 =£454m

FY	1914-15	1915-16	1916-17
Nov. 1914	328.4m	121.6m	
Feb. 1915	362m	221.6m	
Mar. 1915	362m	268m	
May 1915		946m	
Sept. 1915		1400m	
Nov. 1915		1400m	650m

WWI defense spending forecasts

November 13, 1915: "The table shows clearly enough how was expenditure has been increasing. The Prime Minister on Wednesday said that the daily cost of war in April was £2,700,000, and now £4,350,000, so that he was right on September 15th in saying that for some times the issues would not exceed £35 millions a week". (TE, pg. 812)

The Votes of Credit.—The following tabular statement sets out particulars of the eight Votes of Credit that have been moved by Mr Asquith since the commencement of the war :—

Y Date. Year 1914— August 6 November 16 Year 1915— March 1	To End of Financial Year 1914-15. Date. Amount. ear 1914- £ August 6 100,000,000 November 16 225,000,000 Year 1915 ear 1915- July 20 March 1 37,000,000		Financial Year 1915-16 (to Date). Amount. £ 250,000,000 150,000,000 250,000,000 400,000,000
Total	362,000,000	Total	1,300,000,000
Total voted since commencement of the war)		£1,662,000,000	

November 13, 1915: Britain is currently spending £4.45 million a day on the war. Another vote of credit put total VoC in 1915-16 at £1300m. (TE, pg. 806)

Defense news shock: In November, there is an increase to the September estimate, so only count the November estimate but hard to know by how much did Army and Navy spending increase. By this time, it is clear that the war will continue onto 1916-17, with discussions of whether it will end around August/September 1916. Thus assume £1400m a year is extended until September, so cost of war in 1916-17 will be about £1400m/2 = £700m. This is over a pre-war defense budget of £80m a year, so shock of £660m.

1915Q4: PDV = 660/1.035 = £637.7m

December 18, 1915: "The expenditure of the United Kingdom was £1,490,000 per day for the first eight months, and has been rising rapidly since, until it is estimated at £4,450,000 per day for the five months to March 31st next. The total expenditure to that date is estimated on actual and Budget figures at £1,222,200,000, plus £474,800,000 for external loans, or £1,697,000,000 together. These figures represent the excess over a previous £80,000,000 a year for the Army and Navy". (TE, pg. 3)

February 19, 1916: PM (Asquith): "I think that when I last asked the House in November to grant the Government a Vote of Credit, I said that our daily liability for the cost of the war would probably amount to, although hoped it would not exceed £5,000,000. That forecast has been very nearly if not quite realised. I need not say that it shows no prospect whatever of being reduced. It is a figure which, if you multiply it by seven days per week, or thirty days per month, and still more if you multiply by 365 days a year, staggers the imagination". (TE, pg. 290)

February 21, 1916: Vote of Credit for £420 million asked, bringing total to £2,082 million. (TT, pg. 4)

FY	1914-15	1915-16	1916-17	1917-18	1918-19
Nov. 1914	328.4m	121.6m			
Feb. 1915	362m	221.6m			
Mar. 1915	362m	268m			
May 1915		946m			
Sept. 1915		1400m			
Nov. 1915		1400m	700m		
Feb. 1916		1600m	895m		

WWI defense spending forecasts

Defense news shock: Estimate for 1915-16 updated from the December article on the CoE speech. Forecast for 1916-17 calculated using daily spending rate of £4.9m, since the £5m daily spending rate "has been very nearly if not quite realised". This yields £1,790m for the full year, so the war cost until September would be £895m. Estimated cost for this year will be around £1500m.

1916Q1: PDV = (1600 - 1400) + (895 - 700)/1.035 = £388.4 million

April 9, 1916: Budget estimate for 1916-17 at £1,798 million. Discussion about expected length of the war, where both McKenna and M.Ribot (Prime Minister of France) agree that "the end of war is in sight". (TE, pg. 662)

May 27, 1916: Another Vote of Credit of £300 million. "This is the eleventh vote granted by the House of Commons to the Government since the outbreak of the war, and makes a total of £2,382 millions sterling - about twelve times the total revenue of the Government in the year before the war. [...] Mr Asquith anticipated that expenditure in the immediate future will average not less than £4,750,000 a day, so that the new Vote is expected to last till the middle of August". (TE, pg. 1020)

Defense news shock: April budget is suggestive that war will perhaps go on longer than September., although "end of war is in sight". The defense budget is not specified, but taking non-war government spending at £200m (as it was earlier), the cost is estimated at £1600m.

1916Q2: PDV = 1600 - 900 = £700m

June 17, 1916: Battle of Verdun and Battle of Somme are both underway. There is talk of a "three years war" among ministers. (TE, pg. 1134)

Expectations are shifting towards a longer war.

July 29, 1916: "The supplementary Vote of Credit for £450,000,000 moved by the Prime Minister in the House of Commons on July 24th, is the third vote for the present financial year. Each of the two previous votes amounted to £300,000,000, so that the total for the year to date is £1,050,000,000. Nine previous votes, covering expenditure during 1914-15 and 1915-16, aggregated £1,802,000,000, making in all, with this year's credit, a sum of £2,832,000,000 raised since the beginning of the war. The details of expenditure from April 1st to July 22nd were grouped by the Prime Minister in his speech under three heads. Expenditure on Navy, Army, and Munitions from April 1st to May 20th took £149 millions, and from May 21st to July 22nd £230 millions; in all £379,000,000. Loans to Allies and Dominions amounted in the first period to £74.5 millions, in the second to £82.5 millions, a total of £157 millions. Food supplies, railways and miscellaneous items in the first period to & £17.5 millions, in the second only £5.5 millions, for the 62 days of the second period it was £318 millions altogether £559 millions". (TE, pg. 181)

Expenditure has been at a rate of £6 million a day, instead of £5 million a day which was used for the previous Budget estimate. CoE says this is temporary and that he has "no reason at the present moment for anticipating that the Budget estimate will be exceeded over the whole year. I hope it will not be". However, "his announcement was taken in some quarters as implying that our rate of spending had been permanently increased, and that the Budget estimate of £1,825,000, as the sum that would have to be found during the current financial year would have to be raised". (TE, pg. 175)

August 5, 1916: "Since the beginning of August, 1914, the total issues from the Exchequer other than on capital account up till the end of last week were £2,646,833,000, and if we add another 35 millions to cover the present week, we arrive at £2,681,833,000 for the Government expenditure during the war period. If we deduct 400 millions as representing two years' normal peace expenditure, this gives us £2,282,000,000 as the approximate cost of the war to the Government of this country. This figure includes sums paid for purchases of American securities and loans to our Allies and Dominions". (TE, pg. 224)

Defense news shock: expectations shift regarding the stalemate in the Western front, with the realization that the war will take longer than previously expected, and may go on for three years (i.e. until mid 1917). This allows us to extend forecasts. Since the spending on Navy, Army and loans to Allies in the first three months of this FY was \$536m, and the expectation is that the war will last at least until the end of this FY, I update the forecast for 1915-16 to 536*4 = \$2144m. No actual mention of war length being extended beyond March 1917, so I will assume that war ends shortly after, and so I assign \$300m for 1917-18.

1916Q3: PDV = 544 + 300/1.035 = £833.9m

FY	1914-15	1915-16	1916-17	1917-18
Nov. 1914	328.4m	121.6m		
Feb. 1915	362m	221.6m		
Mar. 1915	362m	268m		
May 1915		946m		
Sept. 1915		1400m		
Nov. 1915		1400m	700m	
Feb. 1916		1600m	895m	
May 1916			1600m	
Sept 1916			2144m	200m

WWI defense spending forecasts

October 14, 1916: PM (Asquith) introduced another Vote of Credit of £300 million, raising total since the outbreak of the war to £3132 million; "During the 190 days of the current financial year the expenditure has been just under 950 millions. Expenditure on the Navy has been constant, that on the Army has been reduced slightly - a highly satisfactory result in view of its increase in numbers and activity - and that on munitions has grown slightly". (TE, pg. 642)

PRESENT FINAN	NCIAL YEAR (1 DECEMBE	916-17) to DATE-A	PRIL 1 to
Total spent Decrease in Ex- cheq'r balances	£ 1,404,846,152 375,904	Raised by revenue Net borrowings	£ 264,370,327 1,140,099,921
Total	1,404,470,248		1,404,470,248

December 16, 1916: Germans seek to negotiate for peace. CoE (Bonar Law) asks for another Vote of Credit of £400 million and announces that spending estimates for 1916-17 are likely to be exceeded by £350 million: "In any case, it is clear that we shall have to find for our Allies and ourselves in the course of the present financial year well over £2000 millions" (this is total government spending). (TE, pg. 1114)

Since Germany is seeking armistice, assume expectations of war ending in mid 1917 still remains. Also, most recent forecast of defense budget for current FY being £2144m remains. No shock in 1916Q4.

February 12, 1917: "Mr Bonar Law moves Vote of Credit in House of Commons for £550,000,000, and announced expenditure had now risen to £5,790,000 a day". A £200 million share of the VoC is for 1916-17 while the other £350 million is for 1917-18. CoE (Bonar Law) divided 1916-17 into five periods covered by five different VoCs: "In the first period, the average daily expenditure was £4,820,000 a day; in the last it will be £5,790,000 [...] For the whole year, the Votes of Credit will amount to £1,950 millions, and when the cost of government, apart from the war, is added, the total expenditure for the current year will be about £2,140 millions; the total expenditure since the beginning of the war 'reaches the colossal figure' of £4,200 millions". (TE, pg. 270)

March 17, 1917: Actual spending for 1916-17 will be at £2010m. No announcement of spending for 1917-18. Article mentions that war is assumed to carry on until the end of 1917. (TE, pg. 618)

FY	1915-16	1916-17	1917-18
Feb. 1916	1600m	895m	
May 1916		1600m	
Sept 1916		2144m	200m
Feb 1917		2144m	350m
March 1917		2010m	1500m

WWI defense spending forecasts

Defense news shock: Outturn for 1916-17 lower than previously forecasted, but war will carry on for longer than expected. Expectation now is that it will go on until the end of 1917, so forecast spending of $0.75*2010 = \pounds 1500m$.

1917Q1: PDV = (2010 - 2144) + (1500 - 350)/1.035 =£977.11m

May 5, 1917: Budget is announced a month late, and estimates assume daily expenditure of £6.25 million. Total budget estimate at £2290 million for total government expenditure. (TE, pg. 767)

May 15, 1917: "On Wednesday, in the House of Commons Mr Bonar Law proposed a Vote of Credit for $\pounds 500,000,000$, the largest sum ever asked for in a single vote. The previous Vote of Credit for the current financial year was for $\pounds 350,000,000$, which was expected to carry us on until the end of this month. [...] What Mr Bonar Law called 'the alarming feature' of the figures is that the average daily expenditure up to now in the current fiscal year has been $\pounds 7,450,000$, which compares with the Budget estimate of $\pounds 5,500,000$." This is due to abnormal charges of financial aid to Allies which the CoE says "cannot be regarded as representing normal expenditure". Ignoring these two items, the daily expenditure becomes $\pounds 5.6$ million compared to the Budget estimate of $\pounds 5.5$ million, and the CoE says that "there is no reason at this stage to assume that the Budget estimate may not be approximately accurate as regards the expenditure out of the Vote of Credit". (TE, pg. 808)

FINANCIAL YEAR,	1917-18 (to da	ite), APRIL 1 to APRIL	L 28, 1917.
Total spent	173,017,139	Raised by revenue	42,576,836
cheq'r balances	3,186,302	tree corrowinger.	*******
Total	169,830,837		169,830,837

Defense news shock: Budget is announced assuming that war will carry on until the end of FY 1917-18. Thus, from £2290m budget, about £2100m is for defense spending.

1917Q2: PDV = $2100 - 1500 = \text{\pounds}600m$

FY	1916-17	1917-18

Sept 1916	2144m	200m
Feb 1917	2144m	350m
March 1917	2010m	1500m
May 1917	2010m	2100m

July 28, 1917: CoE introduces another Vote of Credit of £650 million: "in the first 35 days of the financial year the average daily expenditure exceeded the Budget estimate by two millions a day; in the subsequent 77 days the average daily excess over the estimate was one million; and over the whole period - that is, the first 112 days of the current financial year - the average daily excess was £1,384,000. In this period, the total expenditure was £6,795,000 per day, against a Budget estimate of £5,411,000. These figures, it should be noted, are not total expenditure, for which the Budget estimate was \pounds 6,275,000 a day, but only expenditure under the votes of credit [...] It is evident, then, that the Government's expenditure for the present year may well be over 2,500 [million]". (TE, pg. 110)

Defense news shock: it is now clear that defense spending has permanently shifted upwards but it is unclear whether the current rate will sustain itself, as there were "abnormal charges" at the beginning of the year. I update the forecasts for 1917-18 for 2400m.

1917Q3: PDV = 2400 - 2100 = £300 million

November 3, 1917: Vote of Credit for \pounds 400,000,000 by CoE on October 30th. Excess above Budget estimate is at \pounds 1 million a day. Average daily expenditure since beginning of FY is of \pounds 6.648 million (a \pounds 1.237 million increase over the original estimate for 1917-18). (TE, pg. 722-23)

December 15, 1917: Vote of Credit of £550 million. Daily expenditure at £6.794 million. Total expenditure for 1917-18 will be no less than £2765 million. War is expected to last until fall of 1918. (TE, pg. 943)

Defense news shock: seems daily rate has shifted to around £6.7 million. Update forecasts to 6.7*365 =£2446m. War will carry on until the fall of 1918, so add 0.5*2446 =£1223m

1917Q4: PDV = 46 + 1223/1.035 = £1227.6 million

March 9, 1918: CoE (Bonar Law) adds £600 million to Vote of Credit to cover spending from April 1st to June 30th. Average daily expenditure from April 1st, 1917 to February 9th, 1918 was £6.557 million; average daily expenditure from April 1st, 1917 to December 1st, 1917 was £6.686 million; average daily expenditure from December 1st, 1917 to February 9th, 1918 was £6.107 million. Budget estimates for 1918-19 assume war expenditure of £2550 million, at a daily rate of £6.986 million. (TE, pg. 418)

Defense news shock: Budget estimates now assume war will carry on for full FY (i.e. March 1919).

1918Q1: PDV = (2550 - 1223)/1.035 = £1282.1 million

FY	1916-17	1917-18	1918-19
Sept 1916	2144m	200m	

Feb 1917	2144m	350m	
March 1917	2010m	1500m	
May 1917	2010m	2100m	
July 1917		2400m	
December 1917		2446m	1223m
March 1918		2446m	2550m

April 6, 1918: Excess expenditure of £406 million in 1917-18; total expenditure was £2696 million, Vote of Credit expenditure at £2450 million. (TE, pg. 562)

April 27, 1918: "Mr Arnold, in a very able speech, [...] argued that post-war expenditure will amount to £720 millions, instead of £650 millions, as expected by the Chancellor. He observed that, owing to increases in prices, wages, and salaries and the much bigger cost of old-age pensions, 'it will for many years come to require at the very least £210 millions to meet the same expenditure which before the war cost £173 millions.' To this £210 millions he adds £70 millions for pensions, £380 millions for Debt charge, and £60 millions for other expenditure, nearly always with 'almost criminal optimism' ignored by the Chancellor, such as increased cost of improved education, which alone will take some £10 to £15 millions". (TE, pg. 668)

June 22, 1918: CoE announces another Vote of Credit of £500 million. Up to June 8th, the actual issues had been below estimate by £9.5 million but CoE tells HoC not to assume that this will be maintained throughout the year as it is due to slowness in production of ships and munitions. (TE, pg. 1038)

August 3, 1918: CoE announces VoC of £700 million. Expenditure up to July 13 is below estimate by 2.5 million. Total expenditure on the war up to now at £7930 million. (TE, pg. 135)

October 5, 1918: "The past half-year's figures are highly favourable, especially when they are not looked into too closely. [...] The expenditure at £1,356 millions is well within half of the £2,972 millions estimated for the year, and looks like a considerable saving. But it would be interesting to know how the saving has been achieved; if through slack and tardy shipbuilding and other kinds of necessary production, it is less satisfactory than it looks". (TE, pg. 415)

Defense news shock: Articles around September and October suggest turning point in war effort and decreased spending (below estimates). There are no specific estimates for this, so assume that it is ± 200 million less.

1918Q3: PDV = - £200 million

On November 11th, Armistice with Germany is signed and World War I is officially over. Several articles mentioning calls for spending cuts after signing of the Armistice.

November 16, 1918: VoC on November 12th of £700 million. Armistice and end of World War I signals huge reduction in military spending: "In the meantime, little new light has been thrown on the financial position by the Chancellor's Vote of Credit speech on Tuesday [...] but the shortening of the war by the magnificent successes of the Allied armies and navies has put a quite different appearance on the financial

prospects. The Chancellor told the House that during the period April 1st to October 19th there had been a saving on the estimates of £60 millions. [...] He gave the House the very gratifying intelligence that the recoverable assets (apart from advances), which he reckoned in his Budget speech to £1,172 millions, are of a far greater value than he then believed. From every point of view, then, the financial position is much better than it seemed likely a few months ago". (TE, pg. 674)

December 7, 1918: "Owing to the cessation of hostilities, some reduction in the national expenditure for war purposes may be anticipated, and although the capital requirements of the State must necessarily continue to be large for some time to come, the Government are anxious to begin as soon as possible to relax restrictions upon capital issues in so far as such issues are urgently necessary for the establishment of local services, trade, and industry upon a peace basis". (TE, pg. 770)

Defense news shock: hard to estimate the exact amount of spending cuts at this point. CoE mentions recovery of loans made to allies and dominions at about £1,172 million. Unclear what the horizon of repayment is, so I assume 10 years. Decrease in army and navy spending will also be considerable for the rest of the FY, say £200 million less. As in Ramey (2016), this is a rough estimate.

1918Q4: PDV = - 200 - (1172/10)/0.035 [1 - 1/1.035^10] = - £1174.7 million

January 11, 1919: "It will be noticed that although total weekly expenditure has increased from an average of £50 millions to £52.9 millions, Supply Services show a reduction from £44.6 millions per week to £41.2, interest on war debt being responsible for the increase. In other words, while our total daily expenditure is just over £400,000 more per day than in war time, the cost of peace preparations, etc., is about half a million a day less than waging the war. Of course, it is obvious that as the Treasury has been already committed, heavy payments must continue for some time to come on many war contracts, but we would point out that expenditure for Supply Services from November 23rd to December 31st shows a weekly increase with unfailing regularity". (TE, pg. 35)

February 22, 1919: Recoverable assets estimated to "not far short of two thousand million pounds". (TE, pg. 329)

March 8, 1919: Budget estimates for 1919-20 on the table below. Army expenditure in 1918-19 was £440 million, so there is a £135 estimated reduction. "The Army Estimates are, of course, dependent largely on policy, and we can only hope that a speedy peace and the firm establishment of the League of Nations will enable economies to be achieved". (TE, pg.)

Army (net)	287,000,000
Navy	149,200,000
Civil Services	445,823,868
Revenue Departments	49,810,966
	931,834,834

1919Q1: PDV = -135/1.035 = - £130.4 million

April 5, 1919: "The expenditure [last year] was £2,579 millions, against an estimate of £2,972 millions, a very handsome saving at first sight, but a very poor result when we remember that the estimate was based

on the expectation that the war would continue throughout the whole year, whereas military operations were actually suspended nearly five months ago". (TE, pg. 555)

About £400 million in cuts in military, so my estimate was about right.

April 19, 1919: New CoE (Chamberlain) to present first post-war budget next week: "... the total expenditure of the country [in Bonar Law's forecast for post-war expenditure] was not to exceed £650,000,000 per annum. In the real world that Mr. Chamberlain has to cater for, circumstances are unhappily different. Out expenditure will be twice to thrice as large as Mr. Law believed. Borrowing will be continued. New taxation ought to be introduced, and next year's estimates, which the Chancellor must always keep in sight, are not likely to be less than £900,000,000. What the actual figures of our Budget will be when we have returned to our normal life is obviously uncertain, and this uncertainty is not the least of the evils arising from the delays and waverings of the Allied policy". (TE, pg. 638)

May 3, 1919: Chamberlain announces estimates of spending "in a future normal year": "He admitted very frankly the difficulty in foreseeing how we shall stand - perhaps in the year after next - when war revenue and war expenditure are both really at an end, and in dealing with this subject he seems to have underestimated his liabilities". As his basis, he takes a spending on all three defense services (Army, Navy, and Air) at £110 million a year. (TE, pg. 716)

Army, Navy, and Air		110
Debt Charge		400
Civil Services		190
Revenue Offices and P. O	••	53
Other Services	••	13
Total		766

May 10, 1919: "The Chancellor arrives at that figure [£110m in defense spending] by adding about 40 per cent to the cost of the Army and Navy before the war, hoping that 'as a result of the Peace Conference the demilitarisation of Europe may be effected without fresh naval competition being started'. But it is of no use hoping for demilitarisation and the end of naval competition unless we are prepared to welcome a new system of foreign policy, a new relationship between nations. If the old system s going to b revived or a new system started that approximates to the old in character [...] then, as it seems to us,this figure of £110,000,000 may as well be thrown straight onto the rubbish heap of unfulfilled ambitions. The old system now would be far more than 40 per cent more expensive than in the pre-war days, for not only will the cost of labour and material be enormously greater, but the margin of security demanded after the experiences of 1914-18 will be much wider than before". (TE, pg. 767)

Defense news shock: Defense spending for 1919-20 is £437 million (287m for Army, 150m for Navy, assuming RAF estimates are included in Navy). Chamberlain (CoE) says that normal year of £110 million in defense spending is difficult to foresee but assumes that it may be reached in 1921-22. An editorial on The Economist says that £110m is improbable to be achieved but offers no alternative forecast. Thus, £327m cut over two years.

1919Q2: PDV = (-327/2)/1.0524 + (-327/2)/1.0524² = - £303 million

On August, 1919, a Cabinet meeting decides on foundation of post-war British defense policy, where "it

should be assumed, for framing revised estimates, that the British Empire will not be engaged in any great war during the next ten years." This becomes known as the 10-year rule. No naval construction to be undertaken and Army and RAF "to save manpower". Idea of "normal year" assumes 10-year rule.

October 28, 1919: CoE (Chamberlain) speech, where he announces supplementary defense spending: Army expenditure for 1919-20 increased by £118 million, Navy is increased by £11 million, and RAF is decreased by £9 million. Total increase in defense spending of £120 million. Estimate for normal year in defense spending is changed from £110 million to £135 million. Chamberlain also mentions that 1920-21 will not be a normal year. (TT, pg. 13)

FY	1919-20	1920-21	1921-22	1922-23	1923-24
May 1919	437	273.5	110	110	110
Oct. 1919	557	286	135	135	135

Defense news shock: £120m supplementary defense spending in 1919-20 and change of normal year estimate to £135m a year. Forecast for 1920-21 now average of original 1919-20 estimate and new normal year defense budget. Shock is difference between estimates of second row to first row.

$1919Q4: PDV = (557-437) + (286-273.5)/1.0524 + (135-110)/1.0524^{2} + (135-110)/1.0524^{3} + (135-150)/1.0524^{4} = \pounds 163.67 \ million$

March 20, 1920: The defense budget estimate for 1920-21 is at £230.7 million. (breakdown is Army = \pounds 125 million, Navy = \pounds 84.6 million, Air Force = \pounds 21.1 million). (TE, pg. 643)

The estimate is lower than the £286m forecast but supplementary defense spending occurs throughout 1920-21 and actual spending turns out to be approx. £282m so no news.

July 3, 1920: The COE has revisited his estimates of expenditure in a 'normal year' and defense component is unchanged. (TE)

December 18, 1920: Supplementary defense spending of £48.2 million presented. The Economist believes in additional extra spending for this FY. (TE)

December 20, 1920: Discussion on Cabinet as to how to further reduce National Expenditure. It is convinced on the "necessity of curtailing military expenditure to the utmost extent compatible with the fulfillment of Imperial obligations and national safety". (TE)

December 25, 1920: The Economist forecasts that defense budget in 1921-22 can still be reduced to about £200 million. This means that 1921-22 will not be a "normal year" as previously thought. (TE)

March 12, 1921: Army Estimates released at £106.3 million. (TE)

April 30, 1921: The defense estimate for 1921-22 is of £193.38 million (breakdown is Army = £95.9 million, Navy = £80.5 million, Air Force = £16.9 million). The Economist criticizes the budget as "an expression of satisfaction" and "complacent". The actual spending at the end of the fiscal year confirms this with a further £11.2 million on top of the £48.2 supplementary estimate in December. (TE)

FY	1919-20	1920-21	1921-22	1922-23	1923-24
May 1919	437	273.5	110	110	110
Oct. 1919	557	286	135	135	135
Dec. 1920			200	167.5	135

Defense news shock: By 1921Q1, expectations shift towards the conclusion that it will take the Treasury longer to enforce the "normal year" defense spending as defense spending for 1921-22 will be approx. £200m. Articles suggest "normal year" will only be possible by 1923-24, so change 1922-23 forecast to midpoint b/w £200m and £135m.

1921Q2: PDV = (200 - 135)/1.057 + (167.5 - 135)/1.057^2 = £90.6 million

August 6, 1921: Committee of businessman chaired by Sir Eric Geddes to advise the Treasury on reducing expenditure. Group asked to propose cuts of £100 million to 1922-23 budget for Supply Services. The Economist comments that this will fall mostly on defense and that Cabinet will likely not go through with the full £100 million cut. (TE, pg. 215)

November 5, 1921: Requirement of an additional £6.72 million for Army, as "arising out of coal stoppage". (TE)

No news. This adds to the £193.4m estimate to make approx. £200m, which is the expected spending considered.

February 4, 1922: The Economist not pessimistic as to balancing of year's accounts. "Cuts proposed by Geddes Committee are intended to balance the Budget if carried out intact." Mentions modification regarding defense. Cuts are expected to be diluted. (TE)

February 18, 1922: Proposals of Geddes Committee is to cut £75 million, with £46.5 million on defense. (TE)

March 4, 1922: The Final Report of the Geddes Committee is to cut £86 million, but government will only fulfill part of it, "which has proved very disappointing to the business world". Of the £46.5 million proposed cuts to defense, only £27.5 will be fulfilled. Also need to account £11 million from battleships which will not be build as result of Washington Conference. Total cut of £38.5 million. (TE)

Defense news shock: Geddes cuts plus Washington Conference. Assign to 1921Q3, when Geddes committee was announced. This means that "normal year" spending for defense will approximately be reached in 1922-23.

1921Q3: PDV = -38.5/1.057 = - £36.42 million

March 25, 1922: Defense budget estimate for 1922-23 at £138.5 million (Army = £65 million; Navy = \pounds 62.5 million; Air Force = £11 million). (TE)

Assume that the Geddes cuts are already factored in. No news.

October 7, 1922: Figures for defense spending over the first 6 months of the 1922-23 show total of £52.2 million. This indicates that defense spending is being cut at a faster rate. (TE)

January 6, 1923: Defense spending in the first three quarters of 1922-23 is of £79.0 million. (TE)

January 8, 1923: "The Army Estimates have been subjected to a detailed examination, and it is believed that a large reduction will be possible. The expectation is that on the Army alone a saving of $\pounds 15$ million will be effected." (TT)

March 10, 1923: "The Air and Navy estimates amount to £70 millions, to which are provisionally added £55 millions for the Army, against £62.5 millions a year ago." Estimate for defense budget in 1923-24 is thus £125m. (TE)

April 7, 1923: Actual defense spending for 1922-23 was £111 million, significantly below the £138.5 million estimate. (TE)

Defense news shock: spending for 1922-23 lower than previously expected. This is already clear in 1922Q4, when the defense spending indicates that it is being cut at a faster rate.

1922Q4: PDV = - (138.5 - 111)/1.0478 = - £26.25 million

April 21, 1923: Defense estimate in budget is of £122 million. It is a reduction of £16 million from the previous year estimates but is £11 million above the outturn for 1922-23. A big part of this reduction, however, "is accounted for by the fall in wages and prices, by the progressive elimination of a variety of charges incidental to the winding up of war accounts and to the general aftermath of the war, and by an increasingly rigid scrutiny of expenditure in every department". (TE)

After Stanley Baldwin wins the general election in May 1923 and becomes PM, another interpretation of the 10-year rule is adopted by the government: that the military should be ready for a major conflict by 1929. Big increase in number of RAF squadrons and cruisers, and Britain began rearmament program. Therefore, I assume a shift in expectations, one where the "normal year" will not materialize. (Ferris, 1987; Crafts & Mills, 2012)

June 27, 1923: Announcement to add 34 squadrons to the RAF, making a total of 82 squadrons. "The scheme is not expected to cost more than five and a half million pounds a year when it is in full working order". This will be carried out between 1924 and 1927. Navy also seeks to add 30 cruisers, which will roughly cost £50m over 10 years. (TT)

Defense news shock: RAF squadrons cost £5.5m per year for 4 years between 1924 and 1927. 30 cruisers cost £50m over 10 years.

1923Q2: PDV = $5.5/0.044 [1 - 1/1.044^4] + (50/10)/0.044 [1 - 1/1.044^{10}] = \text{\$}59.5$ million

January 5, 1924: Spending at £69.0 million in the first 3 quarters of FY 1923-24 compared to £79.0 million in the first 3 quarters of FY 1922-23. The Economist expects savings on the £122 million estimate for FY 1923-24. (TE)

March 8, 1924: Defense spending forecast for 1924-25 is of £114.5 million, with main saving component (around £7 million) coming from the Army. (TE)

Defense news shock: At the end of 1923-24, the total spending is of ± 105.8 million, so savings of ± 16.2 million on the defense budget.

1924Q1: PDV = 122 - 105.8 = - £16.2 million

May 3, 1924: The defense estimate for 1924-25 announced in the budget is of ± 115.3 million. Actual spending is of ± 114.7 million. (TE)

Stanley Baldwin returns as PM. Cabinet accepts Treasury's interpretation of the 10 year rule and its application is to be extended indefinitely starting in 1928. (Ferris, 1987; Crafts & Mills, 2012)

February 7, 1925: The Navy is asking for the construction of 8 cruisers for the next year in addition to the 5 authorized by the previous government, which amounts to £10 million. Admiralty is framing a programme comprising 37 cruisers over the course of the next 9 years. Each cruiser costs roughly £1.75 million. Air Force is asking for additional £3 million. This is still not approved by Cabinet. (TE)

March 14, 1925: Defense budget estimate for 1925-26 is of £120.5 million, an increase of £5.2 million over the previous year, mostly through increasing the Navy budget. Actual spending for the year is £119.4 million. (TE)

August 1, 1925: New naval construction programme is approved by Cabinet. White Paper outlining details of the program was published this week, where the government "contemplates [...] the construction between 1925-26 and 1929-30 of nine Class A and seven Class B cruisers, 27 destroyers, 24 submarines, and various other craft, which will cost in all £58 million". (TE)

Defense news shock: Additional naval spending of £58 million for the next 5 years as had been planned by the Baldwin administration. Assign this to 1925Q1 as program was announced then and only now approved by the Cabinet.

1925Q3: PDV = (58/5)/0.045 [1 - 1/1.045^5] = £50.92 million

March 6, 1926: The defense budget estimate shows a reduction for the 1926-27 of £4 million. (TE)

May 1, 1926: Estimate is confirmed in the budget, where defense spending for 1926-27 is estimated at ± 116.6 million. Actual spending is ± 116.7 million. (TE)

Regard this as no news, since there is no major announcement of policy changes.

March 12, 1927: The defense budget forecast for 1927-28 is of £115.1 million. (TE)

April 16, 1927: Budget confirms defense estimate of £115.1 million. The Economist comments that the CoE (Winston Churchill) "threw up the sponge" in trying to reduce armaments expenditure and that there

may have to be a supplementary estimate of a few millions to pay for an expeditionary force in China. Actual spending at the end of the year is ± 117.4 million. (TE)

June 25, 1927: Parliamentary reviews for armed forces are carried out and conclude that there is no scope for further cutting unless there is a change of policy. (TE)

April 28, 1928: The budget's defense estimates for 1928-29 are of £114.6 million. Few changes to Army, Navy and Air Force. Actual spending of £113.5 million at the end of the year. (TE)

April 13, 1929: The defense estimates for the 1929-30 budget is of £112.6 million. The Economist's opinion is that "the gigantic cost of armaments has undergone disappointingly small reduction over the last 5 years". (TE)

March 8, 1930: London Naval Conference is going on, with purpose of reviewing the treaties of the 1922 Washington Conference, and placing limits on naval capacity around the world. Uncertainty about future shipbuilding efforts until results of the conference are known. Construction of ships for 1930-31 are reduced by £3 million. Total navy estimates for FY 1930-31 reduced by £4.1 million. (TE)

Defense news shock: small reduction in Navy spending.

1930Q1: PDV = -4.1/1.043 = - £3.93 million

April 17, 1930: A White Paper outlines the results of the London Naval Conference, which include tonnage restrictions on ships, a regulation of submarine warfare, and a five-year moratorium on the construction of capital ships. The WP estimates that "between now and the end of 1936 the British taxpayer will be saved about £67 million, of which £50 million represents the cost of the new battleships we might have built under the Washington Treaty, £4 million the economy effected by reducing the battleship fleet at once to fifteen vessels, and £13 million the saving on cruisers, destroyers, and submarines, taking the final British proposals at the Geneva Conference as the basis of comparison". (TT)

April 19, 1930: The defense estimates in the budget are as expected and total ± 110.1 million. The eventual outturn is ± 110.5 million. (TE)

Defense news shock: London Naval Conference implies a negative shock, as outlined by the White Paper, of £67 million over 6 years.

1930Q2: PDV = - (67/6)/0.043 [1 - 1/1.043^6] = - £57.97 million

February 14, 1931: The CoE (Phillip Snowden) expresses concern about the deterioration of public finances due to an ongoing recession and announces there will be another initiative similar to the Geddes Committee to propose cuts in public spending. (TE)

March 7, 1931: The Navy estimates show that construction of ships will continue at the reduced level of 1930-31 (i.e. a £3 million reduction). (TE)

March 21, 1931: Announcement of the new committee on spending cuts, with Sir George May as the chairman (May Committee). The mandate is considerably broad, with the committee to make

recommendations for all possible reductions to spending on supply services. The estimated deficit for the upcoming FY 1931-32 is of \pounds 42 million. The Economist thinks that this deficit should be addressed by raising taxes and reducing unemployment benefits. (TE)

April 18, 1931: The budget on April 27th will contain defense estimates of £109.6 million for 1931-32. After cuts over the year in response to the recession, actual spending at the end of the year is of £107.3 million. (TE)

June 30, 1931: "In the House of Commons yesterday the leaders of the three parties expressed in varying language and in different degrees a conviction common to them all - that Great Britain has reduced her armaments to a point beyond which she cannot go unless further disarmament is accompanied by equal and concurrent reduction on the part of other nations. [...] Alone among the greater Powers this country has steadily and appreciably decreased its expenditure on national defence since 1924". (TT)

August 8, 1931: The suggestions from the May Committee are announced and include immediate reductions in annual pay for armed services of £2.9 million and several other reductions in annual defense expenditures of £979,000. (TE)

September 12, 1931: A White Paper to accompany the supplementary budget of September 10 was issued, indicating the effects of the proposed cuts by the May Committee on the upcoming budget for 1932-33. Defense expenditure will be reduced by £5 million in addition to cuts in pay and pensions to armed services by £3.6 million. (TE)

Since these defense spending cuts by the May Committee are due to a recession (i.e. economically motivated), I do not consider them.

April 9, 1932: The defense budget estimate for 1932-33 is of ± 104.4 million. This is only ± 5.2 million less than the estimates for the previous FY. The cuts proposed in the supplementary budget have, in most, been realized, and the reason for the higher estimate is an increase in expenditure on naval construction programs. (TE)

In March 1932, after the Japanese invasion of Manchuria and an attack on Shanghai, a Cabinet committee recommends that the 10-year rule should be abolished. German rearmament is still not an issue as Hitler is not yet in power. The CoE (Neville Chamberlain) expects defense spending to rise by about 10% to \pounds 115 million in 1935, and naval construction is back in the agenda (Peden, 1979; Crafts & Mills, 2012).

Defense news shock: buildup of 10% by 1935, which is approximately £10.5 million spread across 3 years.

1932Q2: PDV = (10.5/3)/0.0364 [1 - 1/1.0364^3] = £9.78 million

March 4, 1933: Army estimate for 1933-34 at £37.95 million, compared to £36.5 million for 1932-33. Memorandum notes that "some of the reductions made last year were of a temporary and transitory character to meet the special circumstances of the financial crisis". The Economist criticizes this, saying that "this renewed upward movement in the Army Estimates is a deplorable comment on the progress of the Disarmament Conference." (TE)

March 11, 1933: The Economist publishes a piece criticizing "the retrograde tendency towards an increase in defense expenditure" as Navy Estimates rise by £3 million for a construction program for 1933 including 4 cruisers, 9 destroyers, 3 submarines, and some minor vessels (due for completion by the end of 1936). First Lord comments that estimates "have been restricted to the exigencies of the financial situation and do not fully provide for the potential needs of the Navy". (TE)

April 15, 1933: Defence Estimates to be included in the budget are of £108.9 million. (TE)

This is a confirmation that the CoE (Chamberlain) is pursuing his project to increase defense spending in three years and that the cuts by the May Committee were temporary.

March 10, 1934: Defense spending estimates are at ± 113.7 million for 1934-35. Actual spending is ± 113.9 million. (TE)

Growth in defense expenditure perhaps slightly ahead of the schedule announced by the CoE in 1932. However, there has been no major announcement with new commitments. The Cabinet has been presented with a proposal by the Defence Requirements Committee, which is still under discussion, to raise defense expenditure by £77 million in the next 5 years (Peden ,1979; Crafts & Mills, 2012). Assume there are no shocks in 1934Q1.

July 7, 1934: Naval buildup in Germany, with a response by France. Germany is building up its navy up to the limits allowed for in the Versailles Treaty, as Hitler is now in power and talking about rearming: "Thus the Governments of a bankrupt Europe gleefully pile up naval upon military upon aerial competition - as though they were anxious to demonstrate that the possessing classes are capable of pauperizing themselves as expeditiously as Communists, if they were in power, could do the operation for them". (TE)

July 28, 1934: Government announcement of an increase in the Air Force by 41 squadrons over the next 5 years. (TE)

Cabinet agreed to a 5-year spending program, scaled down to £57 million from the original £77 million (Peden, 1979; Crafts & Mills, 2012).

Defense news shock: Positive spending shock of £57 million over the next 5 years regarding RAF squadrons.

1934Q3: PDV = (57/5)/0.0246 [1 - 1/1.0246^5] = £53.02 million

December 1, 1934: Churchill makes important speech asking the government about its intentions to counter the German rearmament of the last 18 months. Stanley Baldwin's reply is that the air program will be accelerated and 22 squadrons will be formed in 1935 and 1936. (TE)

March 9, 1935: Defence Estimates show an increase of ± 10.5 million (i.e. include the previous announcements of new RAF squadrons). The Economist says that this signals the government's decision to abandon disarmament and comments: "Within the limits of the policy of rearmament this year's increase is fairly moderate. What the bill may be next year is another matter". (TE)

March 16, 1935: The Economist has an editorial on the future of defense spending in the UK, entitled "The Heart of the Matter", following the 1935-36 Defence Estimates and the publication of a Defence White Paper on March 11, 1935, which announces the new policy of rearmament but does not specify spending commitments. The bottom line of the WP is that additional spending on defense cannot be postponed. The Economist sees a permanent shift in position: "...it is certain that the Defence Vote will show a further big increase next year". (TE)

April 13, 1935: Budget estimates defense expenditure at £124.4 million, as previously noted. (TE)

The news here begin signaling rearmament. However, it is still unclear as to its magnitude and urgency. Hard to believe that anyone at this stage was expecting the massive additional defence spending that occurred between now and 1938, but expectations for a considerable increase during the next FY that should be sustained is set. It is also clear that rearmament will be a lengthy process of around 5 years.

July 20, 1935: Great deal of uncertainty as to the magnitude and type of strategy to be pursued as the new British defense policy: "For what kind of operations is the British Army preparing? Is it going to fight with rifle and bayonets or with machine guns? Are the combatants going to march into action or are they going to crawl over the ground in tanks? Is it still true that the next war, if there is to be one, will be won by the infantryman, as so many soldiers still declare, or are the 'revolutionaries' right who think that the movements of a mechanised force seizing and holding certain bases for the use of aeroplanes are the only operations that will take place on the surface of the ground?" (TE, pg. 111)

A supplementary defense spending of £5.3 million is announced to cover an expedited build-up of the RAF. The Economist comments that this is "striking evidence of the scope and rapidity of this year's expansion". (TE)

September 28, 1935: In a speech, the CoE (Neville Chamberlain) has stressed that the UK's "defense forces have fallen to a dangerously low level" and calls for significantly increased expenditure of the Navy and Air Force. The Conservative Party conference is expected to recommend an immediate financing of such expenditure by a national defence loan of £150 to £250 million. The Economist disapproves of this proposal. (TE)

October 5, 1935: Defense spending has sharply increased in 1935Q3 to £32.6 million (31% higher than 1934Q3). (TE)

December 7, 1935: The Economist reports on an estimate made by the Financial News (which later became the Financial Times) on the cost of the rearmament program: 7 new battleships, 20 cruisers, 50 destroyers, 20 submarines and one aircraft carrier might be built in the next five years. Total of £52 million may be spent in enlarging the RAF. Conclusion: "£20 million a year may be added to defense estimates, and the staggering sum of between £140 and £150 million will be required for extraordinary expenditure on rearmament in the next few years". (TE)

FY	1936-37	1937-38	1938-39	1939-40	1940-41
Sep. 1935	125 + 46 = 171	171	125 + 20 = 145	145	145

Defense budget forecasts

Defense news shock: this is the first available estimate of the cost of the shift towards rearmament. According to the estimate by the Financial News, I assume that the cost will be of approx. £150 million spread across five years (i.e. £20m a year for five years plus the £52 million cost for RAF expansion in 1936-37 and 1937-38). This is in line with the speech by Chamberlain in September, which mentions the possibility of a national defence loan of between £150 and £250 million. Therefore, this is assigned to 1935Q3. Also include the July supplementary spending in the shock.

$1935Q3: PDV = 5.3 + (46/1.0246) + (46/1.0246^{2}) + (20/1.0246^{3}) + (20/1.0246^{4}) + (20/1.0246^{5}) = \text{\$}148.47 \text{ million}$

January 4, 1936: Defense spending has significantly increased in 1935Q4 (29% higher than 1934Q4). (TE)

February 8, 1936: Special report by The Economist on "Britain's Air Programme". The article suggests that there is a somewhat accurate idea of the cost of the RAF expansion program, at approximately £41 million over the next two years, in addition to the £20 million a year for "upkeep and replacement". (TE)

This is approx. the same figures used in the 1935Q3 shock.

February 15, 1936: "Rearmament rumours": widely speculated that a large defense loan, following the Conservative Party conference, is in the prospect. Some newspapers, which The Economist regard as "less responsible" suggest the loan is around £400 to £450 million, but *The Times* and *Daily Telegraph* estimate it at around £300 million. "There seems to be some confusion about what expenditure is to be met out of borrowing, as distinct from the large sums normally spent out of revenue. [...] The amount of capital expenditure in excess of the £120 million or so now voted annually for defence, could not equal the sums which have been bandied about this week, unless we were to go far beyond our present idea of air parity and to undertake a colossal naval expansion. The fact that these figures are in circulation suggests, ominously enough, that the Government's ideas are rapidly enlarging." (TE, pg. 345)

The Economist also includes a special report on "Britain's Naval Expenditure". This suggests that the period of military reduction under the Washington Treaty is ending and that an "extraordinary" program which includes "the replacement of several battleships and the provision of 20 cruisers, 50 destroyers, 20 submarines, and one aircraft-carrier, [and] would cost something like £110,000,000 over and above the 'normal' replacements and 'normal' naval expenditure". (TE, pg. 352)

February 22, 1936: Further supplementary spending of £7.8 million for 1936Q1, bringing the supplementary total for the 1935-36 to £13.1 million. The Economist provides a review of the British defense policy on the lead editorial ("Panic or Policy?") noting that there is a consensus in the press that there will be capital expenditure on military services of around £280 million over the next 3-4 financial years, as proposed by the Cabinet's Defence Requirements Committee. Large scale naval expansion is still constrained by treaties until 1937. (TE)

March 4, 1936: White Paper released by the Cabinet on March 3rd, entitled "Statement Relating to Defence", outlines the government's rearmament program but refrains from making long term plans. It mentions significant increases in all three services for the upcoming year, but does not mention any costs, which will be available in the upcoming defense estimates. Some of the details are: 2 battleships to be

built, 20 additional cruisers, total strength in first line aircraft will rise from 2,000 to 2,400 in 1937, and the Army will have 4 new infantry battalions. (TT)

March 7, 1936: Defence Estimates to increase by \pounds 31 million for 1936-37. There will also be Supplementary Estimates during the year, which are hard to predict but are sure to be at least \pounds 25 million and could amount to \pounds 50 million, as noted in the White Paper.

In another lead editorial on defense, The Economist says that this is a "declaration of Governmental intentions, in broad and vague outline, without any indication of the cost of realizing them". It continues: "Gone, therefore, are the hopes, or fears, of the publication of a fully-fledged, detailed Government Defence Programme, including expenditure, over many years, amounting to hundreds of millions of pounds". (TE)

March 14, 1936: The Defence Estimates for 1936-37 are £158.2 million, showing an increase of £33.9 million from the FY 1935-36 estimate. The Economist comments that these figures do not account for any additional cost of the rearmament scheme outlined in the White Paper, which may require an additional £40 to £80 million. (TE)

FY	1936-37	1937-38	1938-39	1939-40	1940-41
Sep. 1935	125 + 46 = 171	171	125 + 20 = 145	145	145
Feb. 1936	125 + 70 = 195	195	195	195	

Defense budget forecasts

Defense news shock: assume that the rearmament cost is updated to £280 million until 1939-40 (i.e. £70m additional spending each year) plus supplementary spending of £7.8m in February. For the upcoming year, since the defense budget increased by £34m and there are indications that there might be supplementary spending of £40m to £80m, anything above the forecast of £195m will be a shock.

$1936Q1: PDV = 7.8 + (195 - 171)/1.0245 + [(195 - 171)/1.0245^{2}] + [(195 - 145)/1.0245^{3}] + [(195 - 145)/1.0245^{4}] = \text{\pounds}145.97 \text{ million}$

April 4, 1936: Actual defense spending at the end of 1935-36 is £136.9 million. The Economist comments that this information does not change the outlook discussed on March 14. (TE)

April 25, 1936: The Budget confirms the Defence Estimate of £158.2 million for 1936-37. The CoE (Neville Chamberlain) stated that the additional spending on rearmament from the White Paper will exceed £20 million. He also announces that the Treasury is considering meeting the costs of defense expansion through borrowing rather than taxation. (TE)

It now seems clear that defense spending "will continue to rise on a sustained basis but magnitudes are still unclear" (Crafts & Mills, 2012). In December 1935 (announced in September), the cost of the rearmament program was thought to be of £152 million for the next 5 years. On February 1936, the consensus was £280 million for the next 4 years.

May 9, 1936: Supplementary naval estimate of £10.3 million for the constructions of new ships outlined in the White Paper released on March 3rd. (TE)

July 11, 1936: Supplementary estimates of $\pounds 20$ million were presented this week. Defense spending will be at least $\pounds 54$ million more than last year. (TE)

Up to now, rearmament costs for this year at £30.3m, which is accounted for in the latest forecast. No shock.

November 28, 1936: A recently issued brokers' circular predicts the Defence Estimate for 1937-38 to be £220 million, which the The Economist considers "not prima facie unreasonable". (TE)

January 2, 1937: Total expenditure in the first 3 quarters of the fiscal year are £126.7 million. The Economist says that it is therefore unlikely that the defense spending in 1936-37 will exceed £178.2 million. (TE)

January 23, 1937: Another editorial on defense policy by The Economist fiercely opposes the idea of a Defence Loan which it says is now widely believed will be announced imminently, probably at £150 million. It still thinks that Britain is on the verge of enormous expenditures on rearmament. (TE)

February 13, 1937: The government announces the introduction of a bill, the Defence Loans Act, to permit it to borrow up to £400 million for defense expenditure over a period of up to 5 years. The Economist comments: "the effect will be to bring the country face to face with the stupendous scale of the preparations on which we are now embarked". (TE)

February 20, 1937: Another Defence White Paper on the rearmament program is published. This does not offer a lot of precise data on the acceleration of rearmament but says that it would be imprudent to expect total expenditure on defense in the next 5 years to be less than $\pounds 1,500$ million and that the defense spending of the next 2-3 years will be much higher than that of the current year. In following articles throughout the year, The Economist repeatedly refers to the projection of a yearly defense expenditure of $\pounds 300$ million for the next 5 years. (TE)

March 13, 1937: Defense spending announced for next year to be ± 277.7 million, and is open to probable additions throughout the year. This will be financed either by taxation or borrowing. (TE)

March 20, 1937: In another lead editorial on British defense policy, The Economist comments that "the staggering scale of our war preparations begins to loom larger and larger". (TE)

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FY	1936-37	1937-38	1938-39	1939-40	1940-41	1941-42
Sep. 1935	125 + 46 = 171	171	125 + 20 = 145	145	145	
Feb. 1936	125 + 70 = 195	195	195	195	195	
Mar. 1937	186 (actual)	300	300	300	300	300

Defense budget forecasts

Defense news shock: rearmament program now fully under way.

1937Q1: PDV = -9 + (300-195)/0.0279 [1 - 1/1.0279^5] = £474.77 million

April 24, 1937: The Budget confirms the defense expenditure for 1937-38 to be £278.3 million (£80 million will be financed through borrowing). The CoE (Neville Chamberlain) does not expect supplementary estimates this year. (TE)

March 5, 1938: Another "Statement Relating to Defence" White Paper is published. The Economist says it is the "least sensational" of the series of defence White Papers of the past 4 years, but mentions that "even last year's gigantic estimate of £1500 million is certain to be exceeded". It also reveals that the Defence Estimates for 1938-39 is of £343.2 million (£90 million financed through borrowing), and that defense expenditure in 1939-40 (which is assumed to be the peak year) is likely to exceed that of 1938-39. (TE, pg. 489)

March 12, 1938: In a defense debate in the House of Commons, the PM (Neville Chamberlain) warns that expenditure levels will be considerably above the £1.5 billion. (TE)

FY	1937-38	1938-39	1939-40	1940-41	1941-42
Mar. 1937	300	300	300	300	300
Mar. 1938	300	343.2	370	345	345

Defense budget forecasts

Defense news shock: As there are no indications of values for the defense budget beyond 1938-39, the CoE's rhetoric has to be interpreted. I assume something "considerably" above the £1.5bn estimate will be at least £1.7bn (i.e. £200m more). So given the £343m defense budget announced for 1938-39 and the fact that 1939-40 is expected to be the peak year, I assume that there is a peak to £370m in 1939-40 and the following budgets return to the 1938-39 level. This is a fairly rough estimate.

1938Q1: $(343.2 - 300)/1.0261 + (370 - 300)/1.0261^2 + (345 - 300)/1.0261^3 + (345 - 300)/1.0261^4 =$ £190.8 million

April 9, 1938: Confirmation of Defence Estimates at £343.2 million for FY 1938-39. (TE)

April 30, 1938: In his budget speech, the CoE (John Simon) states that there might be additional borrowing at the end of the year to finance the acceleration of the rearmament program. (TE)

June 11, 1938: The Economist issues a special report on a long-term analysis of the Budget, where it mentions that the future of defence spending cannot be predicted at the moment: "On the one hand, it is the official doctrine that a large part of the present expenditure is non-recurring, and it seems only reasonable to hope that we shall not for ever re-arm at the present rate. On the other hand, technical progress tends to increase the scale and therefore the cost of armament. Unless international relations become more settled than at the present we are likely to be spending at least £200 millions a year on defence for a long time to come". (TE)

Assume minimum/baseline spending is £200m going forward.

July 16, 1938: A supplementary estimate for RAF construction programs is issued, at £22.9 million. (TE)

Defense news shock: supplementary spending

1938Q3: £22.9 million

After annexing Austria in March 1938, Hitler threatens to invade the Sudetenland (in Czechoslovakia). In September 29, 1938, Germany, Italy, Great Britain, and France sign the Munich Agreement which forces the Czechoslovak Republic to cede the Sudetenland to Germany. By this point, it is clear that Hitler is pursuing a bellicose foreign policy and that the prospects of a war are considerable. Talks of further rearmament begin to take place in Britain.

November 19, 1938: The Economist opens its weekly issue with graphs comparing British annual defense expenditure with that of other European countries undergoing rearmament. It shows Britain significantly trailing behind countries such as Germany and Russia. (TE)

February 11, 1939: "To judge the trend of expenditure, further Defence Supplementaries of at least £20 millions will be required before the end of March". (TE)

February 18, 1939: Defence White Paper published. Army supplementary spending at £8.025 million. (TE)

February 25, 1939: Defence White Paper stated that estimated cost for defense in 1939-40, which now adopts a broader interpretation including air raid precautions and storage of food and materials, will be at $\pounds 580$ million. Additional supplementary estimates for 1938-39 also announced, at $\pounds 8.1$ million for the RAF. Also, actual spending in 1938-39 will be of $\pounds 400$ million (total supplementary spending of $\pounds 56.8$ million). (TE)

FY	1937-38	1938-39	1939-40	1940-41	1941-42
Mar. 1937	300	300	300	300	300
Mar. 1938	300	343.2	370	345	345
July 1938		366.1	370	345	345
Feb. 1939		400	580	500	500

Defense budget forecasts

Defense news shock: Rising forecasts. No indication of increased spending for 1940-41 or 1941-42 but it would be unrealistic to assume that the budget will remain at £345m. Therefore, I use a £500m estimate, as 1939-40 is still assumed to be a peak year.

1939Q1: PDV = $(400 - 366.1) + (580 - 370)/1.0313 + (500 - 345)/1.0313^2 + (500 - 345)/1.0313^3 =$ £524.6 million

March 15, 1939: Germany occupies the rest of Czechoslovakia, in violation of the Munich Agreement. (TT)

April 1, 1939: France and Britain guarantee the border integrity of Poland (i.e. will go to war with Germany if it invades Poland). (TT)

April 29, 1939: In budget speech, the CoE (John Simon) announces that supplementary estimates of around £50 million should be expected for 1939-40, for measures such as doubling the Territorial Army, so that defense spending will actually be around £630 million. (TE)

Defense news shock: supplementary spending

1939Q2: PDV = £50 million

June 3, 1939: "Expenditure will, of course, continue to increase during the year, but it may be that the rate of increase is no longer rising". (TE, pg. 533)

July 8, 1939: Report by The Economist shows evolution of quarterly defense spending since 1935 (seen below). (TE)

DEFENCE EXPEND	ITURE, IN	ACLUDING	Issues 1 5	UNDER D	EFENCE
	66	millions))		
	1935-36	1936-37	1937-38	1938-39	1939-40
First quarter	27.5	37-5	46.3	65-8	123-9
Second quarter	30.3	41.2	58.3	86-4	***
Third quarter	37.3	48.0	68-3	102.9	
Fourth quarter	41-8	59.4	89.3	127.5	

July 22, 1939: CoE (John Simon) announces that, as a result of heavy supplementary estimates, defense spending for 1939-40 will be £730 million. Next year's defense budget is expected to increase to £750m. (TE)

Defense budget forecasts

FY	1937-38	1938-39	1939-40	1940-41	1941-42
Feb. 1939		400	580	500	500
July 1939			730	750	750

Defense news shock: Heavier rearmament program.

1939Q3: PDV = $(730 - 630) + 250/1.035 + 250/1.035^2 = \text{\pounds}574.9$ million

September 1, 1939: Germany invades Poland.

September 3, 1939: UK and France declare war on Germany and World War II begins.

(All entries in **bold from now until 1945 indicate significant events from World War II, taken from the timeline available in the World War II Database website:** http://ww2db.com/)

September 30, 1939: Britain declares war on Germany on September 3, 1939. By the end of September, the CoE (John Simon) presents the first war budget. Budget estimate in 1939-40 is at £1453 million. "This is the outline of the picture for 1939-40. That of 1940-41 is even hazier. [...] If, therefore, we say

that the total expenditure in 1940-41 cannot be less than £2,400 millions, we are certainly not exaggerating the figures". The article then goes on to assume that total expenditure in a "normal" war year is of £2,400m, "but can it be relied upon not to be much more? To predict the 'ceiling' of war expenditure is obviously an impossible task. But, clearly, if we are to win the war, we have to measure our effort not by any absolute standard but by comparison with the enemy. We shall defeat Germany only by making greater efforts than she does, and since Germany will do her utmost, we must do our utmost also". The Economist thus estimates that a reasonable "ceiling" for total government spending is of £4,000 million a year. (TE)

War budget forecasts

FY	1939-40	1940-41	1941-42
July 1939	730	750	750
Sept. 1939	900	1800	900

Defense news shock: At the beginning of the war, it is unclear how long the war will take. Many articles reference World War I in talking about the length of the war but also talk about increased talks and the "Phony War" that was the beginning of WW2. Taking non-war government spending at around £600m, I update defense spending for 1939-40 to be £900m and that of 1940-41 to be £1800m. No mention of war beyond 1941, so assume budget of £900m for 1941-42.

1939Q4: PDV = $(900 - 730) + (1800 - 750)/1.035 + (900 - 750)/1.035^2 = \text{\pounds}1324.5$ million

March 11, 1940: Rationing of certain foods (i.e. meat) start in the UK.

March 16, 1940: CoE (John Simon) announces Vote of Credit of £700m. Present total expenditure is £6.5m a day of which war expenditure makes up £5 million a day. (TE, pg. 460)

March 23, 1940: "Our war expenditure is only just over half the German; it should be considerably larger. We should cultivate the attitude, not of gasping at every new piece of financial burden that any reflective person could have foreseen years ago, but of being dissatisfied with our rate of expenditure so long as it is less than, say, the £10 millions a day that would just about equal Germany's present effort. Above all, we need a sustained effort of inspired leadership to convince the people of Britain and the peoples of the outside world that we have a Two-Year Plan for victory, that it has been set at the utmost attainable and that no effort will be spared and no sacrifice left uncalled for to reach it". (TE, pg. 505)

March 25, 1940: "The possibility of an early peace in Europe is no longer an important consideration in American financial markets". (TT, pg. 11)

FY	1939-40	1940-41	1941-42
July 1939	730	750	750
Sept. 1939	900	1800	900
March 1940	900	1825	1825

War budget forecasts

Defense news shock: Expectations that war will take two years. Current defense spending is at £5 million a day, which is equivalent to £1825m a year. Extend that to 1941-42 as well.

1940Q1: PDV = 25 + (1825 - 900)/1.027 = £925.7 million

April 6, 1940: The Economist reports an estimate of total budget spending for 1940-41 at £3,000 to £3,400 million. (TE, pg. 605)

April 24, 1940: CoE (John Simon) announces budget with war expenditure at £2,000 million (and £667m for civil expenditure), which he says is mostly guesswork. Heavily criticized by both The Economist and The Times as too little; The Economist claims that this is a spending rate that would lose the war. (TT, pg. 4)

April 27, 1940: Protest against budget in HoC; bolder policy urged. Critics wish to add another £1,000 million to the £2,000 million projected expenditure for 1940-41. "The Nazis are spending at least £2,500 millions and probably £3,000 millions or even more this year on the war. Is there any pretence that we shall win with a smaller effort than theirs?" (TE, pg. 759)

May 9, 1940: Conscription in the UK extended to age 36 for men.

May 10, 1940: Germany invades Belgium, France, Luxembourg and the Netherlands. Neville Chamberlain resigns as PM and Winston Churchill becomes PM, forming a wartime coalition government.

May 13, 1940: Churchill gives his "blood, toil, tears, and sweat" speech in the HoC.

May 25, 1940: Emergency Powers (Defence) Act passed in the HoC. As The Economist puts it, "In short, the Government takes control of everybody and everything. It is the complete conscription of persons, labour and capital". (TE, pg.)

May 26 - June 4, 1940: Evacuation of Dunkirk

June 3, 1940: "Intensification of the war calls for increased production to meet expanded needs". (TT, pg. 11)

June 10, 1940: Italy declares war on the UK and France

June 13, 1940: Paris capitulates

June 24, 1940: "... the possibility of the war coming to an early end was quickly dismissed". (TT, pg. 11)

FY	1939-40	1940-41	1941-42	1942-43
July 1939	730	750	750	
Sept. 1939	900	1800	900	
March 1940		1825	1825	900

War budget forecasts

June 1940	2000	2000	2000
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Defense news shock: rate of German expenditure (i.e. £10 million a day) plus events in the Spring of 1940, with the German invasion of Western Europe, the capitulation of Paris and the British evacuation of Dunkirk increase the prospects of annual war expenditure and for the length of the war. However, hard to tell by how much the defense budget will increase beyond the £2000m announced by the CoE. I keep it at that level and extend it to 1942-43.

1940Q2: PDV = $(2000 - 1825) + (2000 - 1825)/1.03 + (2000 - 900)/1.03^2 = \text{\pounds}1381.8$ million

July 6, 1940: "Dramatic rise in supply costs during June suggests that Lord Simon's April Budget understated the burden of expenditure for the current year by £750 millions to £1000 millions". The Economist produces a table of the evolution in annual war spending (seen below) and concludes: "Even if there were no further increase in the rate of expenditure during the remainder of the year, total expenditure would be little short of £3,300 millions; but a higher rate of spending than this is, in fact, inseparable from the expanding war effort". These figures are total government spending. (TE, pg. 9)

ANNUAL RATE	OF EXPENDITURE
Four weeks ended : (£ mns, Sept. 30, 1939 1,701 Oct. 28, 1939 1,682 Nov. 25, 1939 2,100 Dec. 23, 1939 2,481 Jan. 20, 1940 2,244	 Four weeks ended: (f. mns.) Feb. 17, 1940 2,423 Mar. 16, 1940 2,592 Mar. 31, 1940* 3,406 May 4, 1940⁺ 2,308 June 1, 1940 2,411 June 30, 1940 3,476
* Two weeks.	† Five weeks.

July 8, 1940: CoE to ask HoC to authorize supplementary Vote of Credit of £1,000 million for war expenditure in current financial year. Approved on July 10th. (TT, pg. 2)

July 10, 1940: Total expenditure at a rate of \pounds 3,500 million a year (\pounds 9.5m a day). War expenditure at rate of \pounds 2,800m a year, \pounds 7.5m a day. Clear that \pounds 2,000 million estimate for war spending by John Simon will be exceeded. (TT, pg. 4)

July 10, 1940: Battle of Britain, Hitler's attempt to invade the UK, begins on July 10th with Luftwaffe raids on channel shipping.

July 24, 1940: Third War Budget announced by new CoE of the Churchill administration (Kingsley Wood), where total war expenditure for 1940-41 is at £2,800 million (total expenditure of £3,467m). This includes many non-defense items amounting to about £300m so take defense spending as £2500m. (TT, pg. 4)

August 25, 1940: Churchill orders bombing of Berlin for the first time in retaliation for German bombing.

September 15, 1940: Major RAF victory in Battle of Britain, as it manages to drive off most German bombing flights on British cities.

FY	1939-40	1940-41	1941-42	1942-43
July 1939	730	750	750	
Sept. 1939	900	1800	900	
March 1940		1825	1825	900
June 1940		2000	2000	2000
July 1940		2500	2500	2500

War budget forecasts

Defense news shock: war spending is updated to £2500m a year.

1940Q3: PDV = 500 + 500/1.03 + 500/1.03^2 = £1456.7 million

October 19, 1940: "On Wednesday the Chancellor of the Exchequer asked for a further vote of credit of £1,000 millions. The vote given in July will be exhausted by November and, according to present estimates, the new vote will not last beyond early March. The present rate of war expenditure, Sir Kingsley Wood said, was £9 millions a day, or roughly the average daily rate assumed by the Chancellor in July in his revised estimate [for total expenditure] for the financial year." (TE)

Defense news shock: rate of war spending increases sharply with intensification of war effort. The £9m daily rate puts annual spending at £3285, where about £300m is non-defense spending. Thus, yearly estimates increase to about £3000m for 1941-42 and 1942-43. The spending for the current year estimated at £2800m.

1940Q4: PDV = 300 + 500/1.0273 + 500/1.0273² = £1260.5m

FY	1939-40	1940-41	1941-42	1942-43
July 1939	730	750	750	
Sept. 1939	900	1800	900	
March 1940		1825	1825	900
June 1940		2000	2000	2000
July 1940		2500	2500	2500
October 1940		2800	3000	3000

War budget forecasts

October 31, 1940: Battle of Britain is over. Defeat for Nazi Germany.

January 31, 1941: HoC to be asked for another VoC. Last October, rate of war expenditure had reached rate of over £9m a day. "Since then the rate of expenditure has increased". (TT, pg. 4)

February 1, 1941: The Economist reports that in October 1940, annual rate of total spending at £3,850 million and in January 1941, it was at £4,630 million. Expenditure in 1941-42 will be larger than the previous year because of "the steady rise in the physical proportions of the war effort; and because of the steady fall in the value of money". If spending remains at 57% of GDP, then total spending for 1941-42 will be at £5,130 million. (TE)
February 7, 1941: "The House of Commons today readily granted the Chancellor of the Exchequer the two Votes of Credit which he sought - £600 million for the current and £1000 million for the coming financial year - for the prosecution of the war. [...] Our daily rate of war expenditure, Sir Kingsley Wood pointed out, [...] is about £10.5 million". Daily rate of total expenditure at £12.5m a day. This will increase total war spending in 1940-41 to £3300m and war spending in 1941-42 expected to be £3850m. (TT, pg. 5)

March 15, 1941: Lease-Lend bill passed by Congress in the US, which will lend US\$ 7 billion to the British war effort gradually. (TT, pg. 4)

FY	1940-41	1941-42	1942-43	1943-44	
June 1940	2000	2000	2000		
July 1940	2500	2500	2500		
October 1940	2800	3000	3000		
Feb. 1941	2900	3500	3500	1500	

War budget forecasts

Defense news shock: Estimate for 1940-41 slightly raised, and since daily rate of war spending has increased to around £10.5 million, The Times forecasts war spending for following years to be at £3850m. This means actual defense spending of about £3500m. Forecast is extended to 1943-44 as, by this point, it is clear that the war will take longer than previously thought. Expectation that war will be over in two more years extends it into 1943-44, so assume defense spending of £1500m.

1941Q1: PDV = $(3000 - 2800) + (3500 - 3000)/1.025 + (3500 - 3000)/1.025^2 + (1500 - 900)/1.025^3 =$ £1720.9 million

April 5, 1941: Actual total war spending for 1940-41 amounted to £3,220 million. "Total expenditure in the least three months has been at the rate of over £4,800 millions; in the first three weeks of March it was running at the rate of over £5,300 millions. How much of these figures represented the purchase of the goods that will now come under the Lease-and-Lend arrangements it is, of course, impossible for the outsider to say, but a rate of £800 millions a year would seem to be a very generous estimate for British expenditure [...]. If so, the current rate of expenditure *ex* Lease-and-Lend - that is, the probable basis of next year's expenditure figures - can hardly be put much below £4,000 millions". (TE, pg. 441)

"The figure of £4,500 millions for 1941-42 which has already appeared in *The Economist* begins to look like the reverse of an over-statement". (TE, pg. 441)

"By this time the House of Commons and the public have learned to add several hundreds of millions to any Budget estimate of expenditure" (TE, pg. 441)

April 12, 1941: CoE (Kingsley Wood) puts war expenditure at £3,500 million for 1941-42. This excludes Lease-Lend supplies from the US. (TE, pg. 476)

Sabine (1970) mentions how the 1941 Budget was considered a turning point in war budgets. The Economist hailed it as "the first war budget". This is lower than the February forecast for 1941-42

 $(\pounds 3850m)$ but I do not consider a negative shock here as the official war budget estimates tend to underestimate the cost of the war.

May 10, 1941: House of Commons is bombed by the Luftwaffe.

June 20, 1941: "The House of Commons will be asked at its next sittings to authorize another Vote of Credit of $\pounds 1000$ million for war expenditure. This will increase to $\pounds 2,000$ m the amount so voted in the first quarter of the present financial year" (TT, pg. 4)

June 25, 1941: CoE announces VoC of £1000m in HoC. War expenditure is at £10.25 million a day, "together with the invaluable and increasing help we were receiving from the United States". (TT, pg. 4)

June 28, 1941: "Some £710 millions of the first vote of credit, voted in February, have been spent. [...] The rate of expenditure is nearly a third higher than it was a year ago, but it is still below the average of £13.3 millions (for total expenditure) from January to March, 1941 - admittedly the last quarter of the financial year when expenditure always is higher than in the other quarters - and, although the supplies coming forward under the Lease-and-Lend will continue to ease the strain on the Budget, the 'gap' will widen rather than narrow." (TE, pg. 848)

Defense news shock: HoC bombing was signal that war would be longer. Articles mention war extending to 1944. Thus, I raise the defense spending forecast in 1943-44 raised to £3000m.

1941Q2: PDV = 1500/1.025^3 = £1392.9 million

June 22, 1941: Germany invades USSR. USSR joins World War II.

June 25, 1941: "Today's decline in the stock market was cushioned somewhat by the more cheerful business outlook". (TT, pg. 9)

July 8, 1941: UK and USSR sign mutual defense agreement and promise not to sign any form of peace agreement with Germany.

July 12, 1941: "Supply expenditure in the first quarter of this financial year has not appeared low. The weekly average from April 5th to June 30th was £77 millions, which is equivalent to a rate of about £4000 millions in a year, against a budget estimate of £3934 millions." This is also total expenditure (i.e. defense/war plus civil spending). (TE, pg. 44)

"Expenditure is very materially reduced by Lease-and-Lend - Sir Kingsley Wood said in April that the inclusion of Lease-and-Lend commitments would raise a Budget total of £4206 millions to 'far beyond' £5000 millions". (TE, pg. 44)

September 26, 1941: "Expenditure on war purposes alone is still at the rate of about £10,500,000 a day and at that rate £1,000,000,000 lasts for about three months [...] Expenditure other than that on war purposes is at the rate of about £2,000,000 a day, which means that our total expenditure is now at the rate of over £4,500,000,000 a year". (TT, pg. 4)

October 2, 1941: "The House of Commons today voted a further credit of £1,000 millions in addition to the two Votes, each for a similar sum, already sanctioned for our war expenditure this year. [...] Sir Kingsley Wood, in a review of the country's finances and of financial policy, said we were now spending in all some £13 million a day. [...] In two years of war our total expenditure was some £7,018 million, of which £5,668 million was on war services. [...] Speaking of the future, he said resolution, self-denial, and competence must continue to be our watchwords. The task of financing the war was not beyond our resources if we made wise use of them." (TT, pg. 4)

October 4, 1941: "The belief of *The Economist* that the total expenditure, when the balance is struck next March, will be well over £4,500 millions for the full year is made to appear conservative by the latest figures" (TE, pg. 408)

December 3, 1941: Conscription in the UK now includes all men between 18 and 50. Women to serve in fire brigades and auxiliary groups.

December 7, 1941: Japan launches attack on Pearl Harbor.

December 8, 1941: The US and UK declare war on Japan.

December 11, 1941: Germany and Italy declare war on the United States. US reciprocates and declares war on Germany and Italy. US officially joins the war.

December 17, 1941: "Sir Kingsley Wood, Chancellor of the Exchequer, told the House of Commons today, when he asked for a further Vote of Credit of £1000 million - which was readily granted - that we had recently been spending at the rate of nearly £83 million a week or £11.75 million a day" (this is war expenditure, not total). Kingsley Wood also mentions that he cannot estimate war expenditure for the last quarter of 1941-42. Talks about war expenditure of £4,000m for 1941-42. Estimate of aid from Lend-Lease at about £300 million for the year (in addition to £4bn). (TT, pg. 4)

December 20, 1941: *The Economist* thinks that "domestic expenditure, on war and normal purposes, has increased from something like £2800 millions in 1940-41 to something between £3700 and £3900 millions in 1941-42 and to a probable present rate of between £4000 and £4200 millions a year". (TE, pg. 746)

FY	1940-41	1941-42	1942-43	1943-44
June 1940	2000	2000	2000	
July 1940	2500	2500	2500	
October 1940	2800	3000	3000	
Feb. 1941	2900	3500	3500	1500
June 1941		3500	3500	3000
December 1941		3500	3800	3800

War budget forecasts

Defense news shock: Expectations on cost of war shift throughout 1941Q4, as Kingsley Wood announces further Votes of Credit and both The Times and The Economist comment on the rising daily cost of the

war. I update the June 1941 forecasts to match these updated expectations. Budget for this FY is expected to be around the level previously forecasted, but rising cost of supply spending to £4000m to £4200m means that defense spending going forward will be about £3800m. The Pearl Harbor attack and the US joining the war are also signals that the war will take longer, so I update the 1943-44 to a full war year.

1941Q4: PDV = (3800 - 3500)/1.025 + (3800 - 3000)/1.025^2 = £1054.1 million

January 31, 1942: In an editorial, The Economist comments on the upcoming war budget: "Is it, first of all, likely that the real resources required by the Government in the year that begins on April 1st next will be larger than in the year that is now drawing to a close? The answer is certainly yes". (TE, pg. 136)

"For the future, Canada will supply munitions of war, war materials and foodstuffs entirely free of charge up to an amount of \$1000 millions, which is expected to last for another twelve months. The effect of the whole transaction is, then, that the Dominion of Canada is giving the United Kingdom about £225 millions and lending, free of interest for the duration, a further £91 millions". (TE, pg. 139)

February 2, 1942: Daily war expenditure rate at £12 million. (TT, pg. 4)

March 5, 1942: New conscription laws in the UK extend conscription of women up to the age of 45, in addition to men from 18 to 50.

March 11, 1942: Supplementary Vote of Credit of £250 million for war expenditure for the rest of 1941-42, and another one of £1,000 million for 1942-43. In December, CoE (Kingsley Wood) thought that provision of £4,000 million would be sufficient to meet the requirements of 1941-42 but "it was now clear that the £4,000 million would not be sufficient to carry us through the year and after careful examination of the figures of current and probably expenditure, that he must ask for a further grant of £250 million". Thus, war requirements for 1941-42 at £4,250 million, and current daily rate of war expenditure is at £12.5 million. (TT, pg. 8)

March 17, 1942: Rationing of electricity, coal, and gas instituted in the UK.

March 19, 1942: Lord Halifax speech. He claims that "this is by far the most expensive war that has ever been fought and it is getting more expensive every day. In 1938, although we had begun to rearm, we still spent under 10 per cent of our national income on defence. In 1941, war expenditure had risen to somewhere near 60 per cent of national income". (TT, pg. 5)

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FY	1940-41	1941-42	1942-43	1943-44	
Feb. 1941	2900	3500	3500	1500	
June 1941		3500	3500	3000	
December 1941		3500	3800	3800	
March 1942		3900	4200	4200	

War budget forecasts

Defense news shock: rising cost of the war, as government estimates are successively surpassed. Recent figure of £12.5m a day means war effort has risen to about £4.5bn (£4.2bn on defense) a year, and government estimate for 1941-42 updated for a second time to £4.25bn (£3.9bn). UK now has higher

level of mobilization with conscription of both men and women and widespread rationing of consumption.

 $1942Q1: PDV = (3900 - 3500) + (4200 - 3800)/1.025 + (4200 - 3800)/1.025^2 = \text{\pounds}1171 \text{ million}$

April 4, 1942: Total expenditure in 1941-42 of £4,776 million. Expenditure on war at £4,250 million. (TE, pg. 456).

April 7, 1942: "This year there is much less speculation than there was twelve months ago over the ways in which Sir Kingsley Wood will endeavour to solve his Budget problems. These problems are just as difficult as they were last year but [...] the nature of these problems is now more generally understood. There is no longer any fear, even among the least instructed, that the Government will have to cut down expenditure vital for winning the war if they cannot raise the necessary money. [...] How much bigger [expenditure] will be this year no one can be expected to predict with any certainty". (TT, pg. 5)

April 13, 1942: Kingsley Wood presents the fifth war budget: spending on war purposes is now at the rate of £4,500 million a year, and total expenditure at £5,000 million. This does not include Lend-Lease values. (TT, pg. 2)

May 5, 1942: "The talks concerned not only the general military outlook but the internal political situation which is certain to arise after the war in most countries including Germany, irrespective of what the outcome of the war may be". (TT, pg. 3)

May 23, 1942: "Warnings that optimism over the outcome of the war is being overdone, and that the chances are that the conflict will last a long time particularly chilled buying interest [in the US stock market]". (TT, pg. 7)

June 18, 1942: Another £1000 credit for war expenditure - the second one for 1942-43. "Urging recent weeks our total war expenditure had been at the rate of approximately £84.25 million a week, and at this rate it was apparent that the (first) Vote would become exhausted some time during the course of next week". (TT, pg. 8)

Defense news shock: Another change in expectations towards a longer war, as shown by the news of market sentiment in May. Thus, extend forecast to mid 1944, assuming additional defense on 1944-45 (on top of the £900 baseline) to be at about £2000m.

1942Q2: PDV = 2000/1.0242^2 = £1906 million

July 4, 1942: Supply expenditure in the first quarter of 1942-43 was of £1,198 million, considerably larger than the first quarter of 1941-42 at £985 million. (TE, pg. 8)

August 26, 1942: "A further £1000 million Vote of Credit for war expenditure will be submitted to the House of Commons on the day of its reassembly". (TT, pg. 4)

September 10, 1942: "On a motion in the House of Commons today for a further Vote of Credit of \pounds 1,000 million, the third Vote for a similar amount in the current financial year and a total of \pounds 11,050

million since the war began, Sir Kingsley Wood said war expenditure in recent weeks had been on an average £12.25 million a day". (TT, pg. 4)

October 14, 1942: "So far we have barely, and with the greatest difficulty, been able to hold our own defensively against overwhelming odds. For two years the British Commonwealth stood alone, but thereafter we had the support of the heroic and truly colossal effort of Russia; and now, with the grand American effort coming into full swing, we entered upon a new phase, where the defensive can be replaced by the offensive, and the war can be prevented from dragging on endlessly to the destruction of all the material apparatus of our civilization. This switch over will determine the outcome of the war, and therefore deserves the most careful planning". (TT, pg. 4)

This marks the beginning of the offensive by the Allies against Axis powers that will occur in 1943, 1944, and 1945.

October 16, 1942: Another £1000 million supplementary Vote of Credit, increasing the VoC amount for 1942-43 to £4000 million. (TT, pg. 5)

October 21, 1942: "In moving the supplementary vote of credit in the House of Commons yesterday, Sir Kingsley Wood said that the war expenditure during the current year was not likely to differ appreciably from the Budget estimate. After more than three years of war, production in this country is now reaching its peak with the practically complete mobilization of resources." (TT, pg. 5)

October 24, 1942: British troops defeat Germans and Italians at El Alamein in Egypt. Chaotic retreat of Axis forces.

Current spending seems to be in line with forecasts/expectations throughout 1942. Therefore, no shocks.

November 13, 1942: "The encouraging news from virtually all battle fronts cheered Wall Street although there was an inclination to tone down enthusiasm on the outlook for a quick victory". (TT, pg. 9)

January 9, 1943: "The increase in ordinary expenditure during April-December, 1942, has exceeded the year's estimated increase by £40 millions [...] The trend of the cost of the Supply Services remains decidedly upwards; it rose from £1198 millions in April-June, 1942, to £1229 millions in July-September and £1364 millions in October-December, against £1168 millions during the last quarter of 1941. " (TE, pg. 36)

"Since the estimates of the national income and expenditure are based on current prices, they do not show changes in 'real' or volume terms. There can be little doubt, however, that, as in earlier years, the figures for 1942 are inflated by a rise in prices". (TE, pg. 36)

January 16, 1943: Report on The Economist analyzes the evolution of the war economy, showing a transition of total expenditure from consumption towards government expenditure. Share of total government expenditure in 1942 at 56% of national income. (TE, pg. 69)

	Government		Total
	Expenditure	Consumption	Expenditure
1938	19	81	100
1940	44	56	100
1941	52	48	100
1942 *	56	44	100

January 24, 1943: Germany suffer setbacks on Eastern Front, and its forces in Stalingrad are collapsing. Casablanca Conference between Churchill and Roosevelt ends, where agree on the policy of "unconditional surrender" by Germany.

January 27, 1943: Rising Cost of War: "The House of Commons today agreed to a Vote of £900 million to meet expenditure to the end of the financial year and to a further Vote of £1000 million on account of Vote of Credit provision for the next financial year. [...] on October 20 the daily average cost of the war was about £12.75 million and in recent weeks it had risen to about £14 million". (TT, pg. 4)

January 29, 1943: Mobilization and construction of war industry's capital equipment were virtually complete in 1942, suggesting that a plateau in war expenditure had potentially been reached. This has recently proven not to be the case, and "is an important indication of the changed character of the war that the dynamic element in war expenditure is no longer production at home, but expenditure overseas - in Africa and the other parts of the world where offensive operations are proceeding. [...] once again, the Budget estimates will be overspent when the year ends by some 5 per cent".

"The prospect is that war expenditure will increase further, not only because of the mounting cost of overseas offensives, and the cost of reciprocal aid, but also because of the rate of war output at home, in spite of the high degree of mobilization and productivity already achieved, is to be stepped up still more this year". (TE, pg. 36)

February 2, 1943: German defeat at the Battle of Stalingrad.

February 18, 1943: Joseph Goebbels declares "Total War" against the Allies.

March 27, 1943: The Economist has an article on military demobilization after the end of the war: "The demobilisation of men from the Forces is already being studied by several committees, one set up under the Selective Service Act, and another, under General Osborn, which is dealing with the problem of interrupted schooling.". (TE, pg. 392)

	1		1		
FY	1940-41	1941-42	1942-43	1943-44	1944-45
Feb. 1941	2900	3500	3500	1500	
June 1941		3500	3500	3000	
December 1941		3500	3800	3800	
March 1942		3900	4200	4200	
June 1942		3900	4200	4200	3000
March 1943			4400	4700	3500

War budget forecasts

Defense news shock: News from January - March indicate that daily cost of war has risen to £14 million (i.e. £5100m a year, £4700m for defense) and that war spending in the current year would be exceeded by approx. 5% (i.e. £200m). Mentioning demobilization confirms that war is expected to be over by mid 1944. However, I make the assumption that defense spending in 1944-45 also rises by about £500m given the rising intensity of the war effort.

1943Q1: $(4400 - 4200) + (4700 - 4200)/1.025 + (3500 - 3000)/1.025^2 = \text{\pounds}1163.7 \text{ million}$

April 3, 1943: Wall Street now bets on victory by allies, with an eleven-month rise in stocks led by "peace" shares. (TT, pg. 9)

April 9, 1943: Sixth war budget to be announced next week, where the CoE will have to contemplate expenditure which will be not far short of $\pounds 6,000$ million. War expenditure has increased to an average daily rate of $\pounds 14$ million. Estimate from The Times for war expenditure is at $\pounds 5100$ million. (TT, pg. 4)

April 10, 1943: Outturn for war expenditure in 1942-43 was of £4840 million. (TE, pg. 449)

April 13, 1943: Total war expenditure up to now is at £13 billion. Daily rate of expenditure is at £15 million. (TT, pg. 4)

April 14, 1943: "The Budget has had a good reception everywhere. Sir Kingsley Wood has strengthened national confidence both by his method of providing for the enormous war expenditure of the year and, no less, by setting fiscal policy in its true perspective as a continuous process, the war-time phase of which should lead without dislocation into the phase that will follow it". (TT, pg. 5)

April 17, 1943: CoE (Kingsley Wood) presents the sixth war budget. Estimate of total expenditure is at £5,756 million. The Economist comments: "By far the largest Budget that this country has ever seen is also one of the least controversial." (TE, pg. 485)

Sabine (1970) mentions that it became quite clear from the reactions of the press and lobbies that the measures proposed in the budget and the motives behind them had secured a general acceptance and a general welcome. This confirms that expectations had changed in Q1 towards higher spending. Also, articles begin to mention policy prospects after the war in terms of government spending and rebuilding infrastructure and how demobilization should take place. Wall Street is betting on an allied victory soon. This indicates that expectations are shifting towards a probability of the war being over in the near-term horizon (i.e. 1 year).

May 5, 1943: "... the exceptionally good war news continued as the principal props. [...] The 'bullish' war news and the cheerful post-war prospects spurred purchasers". (TT, pg. 9)

May 13, 1943: German and Italian troops in North Africa surrender to Allied forces.

May 26, 1943: CoE asks for a further Vote of Credit of $\pounds1,000$ million. Financial aid from Canada of $\pounds1,000$ million for British war effort reduces the total VoCs under what would have been necessary for 1943-44. Also, no British expenditure for Canadian aid as in previous years. Thus, "since the realized

total of the vote of credit expenditure last year was only £4,840 million, this year's vote of credit represented a substantially larger provision for the war than last year". (TT, pg. 8)

June 17, 1943: Allies bomb Sicily and Italian mainland, signalling forthcoming invasion.

Defense news shock: Allies begin to launch offensive against Axis powers through Italy, and daily rate of war spending increases to $\pm 14.5-15$ million (i.e. ± 5400 m a year, about ± 5000 m for defense). Even though war is expected to be over by the end of 1944, the effort on the Western front will be larger than expected, so I assume full war spending on 1944-45 at ± 5000 m.

1943Q2: (5000 - 4700) + (5000 - 3500)/1.025 =£1763.4 million

June 26, 1943: The Economist comments on an article by Nicholas Kaldor for the *Economic Journal* addressing the issue of national income and expenditure for the "first post-war years". Kaldor's estimates a total annual expenditure of £1720 million with defence spending at £500 million and another £500 million to pay war debts in 1938 prices. On the same page, another article on demobilization. (TE, pg. 816)

July 3, 1943: Expenditure on supply services for the first quarter of 1943-44 at £1304 million, compared with £1198 million for the same quarter last year. (TE, pg. 30)

July 19, 1943: Allies bomb Rome for the first time.

July 23, 1943: "Another £1000 million for the war": supplementary Vote of Credit approved in the HoC. War expenditure at a daily rate of £14.5 million. (TT, pg. 8)

July 28, 1943: "Wall Street was of the opinion that while the Italian developments might be a long step towards victory, a quick finish [to the war] is unlikely". (TT, pg. 9)

In Ramey (2016), articles from Business Week report expectations that the war will be over by the end of 1944, or in 1945.

August 7, 1943: Partial evacuation of Berlin announced by Goebbels. (TT, pg. 4)

August 11, 1943: "War effort and perhaps war expenditure is nearing its peak". (TT, pg. 8)

September 3, 1943: Secret Italian Armistice is signed and Italy drops out of the war. Mainland Italy is invaded by British forces. Meanwhile, Germany begins evacuation of civilians from Berlin.

September 8, 1943: Eisenhower announces Italian surrender to the Allies. Germany enact Operation Achse, the disarmament of Italian forces.

September 21, 1943: "... sentiment encouraged by the continued favourable war news, the brightening outlook for business". (TT, pg. 8)

October 13, 1943: Italy declares war on Germany.

November 10, 1943: Another supplementary Vote of Credit of £1,250 million approved in the HoC. (TT, pg. 8)

November 12, 1943: Mutual Aid in the War: Lend-Lease in Reverse: "In spite of the help of lend-lease, Britain has spent some £1,500,000,000 in the United States since the outbreak of war on supplies of all kinds." (TT, pg. 9)

November 28, 1943: The Tehran Conference: Churchill, Roosevelt, and Stalin meet in Tehran to discuss war strategy and plan June 1944 invasion of Europe, i.e. Operation Overlord.

January 1, 1944: Eisenhower will lead combined attack on Nazi Germany through Western Front. States that "Hitler will fall in 1944". (TT, pg. 3)

January 26, 1944: New CoE (John Anderson) asks for Vote of Credit of £750 million to meet expenditures for the rest of the financial year. A further VoC of £1000 million was also required for 1944-45. Average daily rate of war expenditure at £13.25 million. (TT, pg.)

February 12, 1944: "But for good or for ill, the planning and economic mobilization for war have been all but completed. By the same token planning for the after-war years - for demobilization from war and remobilization for peace - has begun. For the most part the detail of this planning is unknown". (TT, pg. 6)

March 17, 1944: "During recent weeks, Vote of Credit expenditure has averaged about £15 million a day. At this time of year it is normally higher than usual and the average daily rate over the financial year to date has been about £13.5 million". (TT, pg. 8)

Defense news shock: Even though war is expected to end by the end of 1944, defense spending for FY 1945-46 will be higher than a "normal year" due to demobilization, so assume it is £1500m higher than a normal post-war year.

1944Q1: PDV = 1500/1.025² = £1427.7 million

April 8, 1944: War expenditure in 1943-44 turned out to be around £5410 million. (TE, pg. 460)

April 26, 1944: CoE (John Anderson) presents war budget for 1944-45. Vote of Credit for the year is estimated at £5 million.

Sabine (1970) mentions how John Anderson says in his budget speech that estimating war needs at the moment is more difficult than at any time during the war due to upcoming military operations on the Western front. Also mentions how the House generally approved the budget, as did the press. This means that expectations are that war spending will decline in 1944-45.

May 17, 1944: Supplementary Vote of Credit of £1000 million approved by HoC. (TT, pg. 8)

Also, The Times reports on decreasing war costs: "Expenditure for the week to May 13 amounted to \pounds 92.2 million (\pounds 128 million in the previous week) [...] For the current financial year to date the deficit is \pounds 385.6 million compared with a deficit of \pounds 441.9 million a year ago". (TT, pg. 9)

June 6, 1944: D-Day begins with landing of 155,000 Allied troops on the beaches of Normandy, France. Allied soldiers break through Atlantic Wall and push inland in largest amphibious military operation in history.

Defense news shock: Ramey (2016) shows various articles by Business Week citing projection that Germany would be out of the war "by late summer", starting in June, due to the success of Operation Overlord, and therefore assumes a negative shock due to an expectation change that European war will end one year earlier than expected. There is little indication of what defense spending in the UK will be in a post-war year, except for the forecast made by Kaldor in 1943, saying that it will amount to £500m in 1938 prices (which equals to about £650 million in 1944 prices). However, this seems like a figure for a "normal" post war year, and the defense spending for a year immediately after the war would be higher due to production contracts, etc. Therefore, I will use the same value announced by the US and used by Ramey (2016) that there cut in military production/spending in the first post-war year is of 40%. Also, given the news commenting on declining costs of war I will assume expectations for 1944-45 shift down to £4.8bn. Thus, negative spending shock of £200m in current FY and of 0.4*5000 = £2000m in the next FY.

1944Q2: PDV = - 200 - 1000/1.025 = - £1175.6 million

FY	1941-42	1942-43	1943-44	1944-45	1945-46
June 1942	3900	4200	4200	3000	
March 1943		4400	4700	3500	
June 1943			5000	5000	
Feb 1944			5000	5000	4000
June 1944				4800	3000

War budget forecasts

July 19, 1944: Another supplementary Vote of Credit of £1,000 million approved by HoC. Increases Vote of Credit to £3,000 million for 1944-45. (TT, pg. 8)

August 19, 1944: French Resistance begins an uprising in Paris due to Allied approach to the Seine River.

August 25, 1944: Paris is liberated. The German military disobeys Hitler's orders to burn the city.

September 3, 1944: Toulon, Marseilles, Lyon, and Brussels are liberated by the Allies.

September 9, 1944: "The war in Europe is rapidly coming to an end". (TT, pg. 3)

September 22, 1944: "With the unconditional surrender of Germany, military operations in Europe will come to an end, but the war will go on until the collapse of Japan. The European armistice cannot, as Mr. Bevin often pointed out, be the signal for a general military demobilization or for the termination of conscription for war service. It will nevertheless be followed by great changes in the use of British industrial resources and labour power, and these changes will begin the process of releasing men and

women both from the fighting services and from civilian war work to embark upon the most urgent tasks of reconstruction". (TT, pg. 5)

September 29, 1944: Nazis prepared for guerilla war. Washington and London warn that formal surrender is unlikely. (TT, pg. 4)

October 21, 1944: Another Supplementary Vote of Credit of £1250 million. CoE said that "the average daily rate of expenditure has fluctuated considerably, with a general tendency to rise. The average for the three months ended June 30 was a little over £13.25 million daily, whereas the succeeding three months it was nearly £14 million." (TT, pg. 8)

November 2, 1944: Estimates presented by John Anderson to HoC consider only 1946 as a post-war year, indicating that the Government expects the war to be over in 1945. (TT, pg. 2)

Defense news shock: As shown by the most recent articles, the expectations that the European war would be over by the end of the summer did not materialize, as Germany refuses to surrender, and Allied forces suffer setbacks in Western Europe. Ramey (2016) shows from Business Week articles that previously, the expectations were that Germany would have surrendered by October 31st, 1944 and Japan by the autumn of 1945. Now, the Business Week scenario is that Germany falls in June 1945 and Japan falls 6 months later. This means that the standing forecast, which assumed that the war would be over by October 1944, will be exceeded. It is hard to know by how much, so we assume that the value of vote of credit expenditure of £4500m (£4200m for defense) announced by the CoE as an "interim budget" in April 1945 for 1945-46, when the capitulation of Nazi Germany was in sight, is known in 1944Q4. Therefore, there is a positive shock regarding expectations of defense spending in 1945-46.

1944Q4: (4200 - 3000)/1.0125 = £1185.2 million

January 2, 1945: Expenditure on British war effort has cost approximately £25 billion to date. (TT, pg. 9)

Transitions begins in industry: "[in 1944] problems of transition from war to peace for the first time came into the foreground". (TT, pg. 14)

January 25, 1945: Supplementary Vote of Credit of £1 billion approved by HoC. CoE (John Anderson) says that "during recent weeks the total war expenditure had averaged £14.25 million". Additional VoC makes a total of £5.25 billion for the year, £250 million above the budget estimate. (TT, pg. 7)

January 25, 1945: Allies officially win the Battle of the Bulge, which turned out to be the last major German offensive campaign in World War II.

March 27, 1945: Western Allies slow advance in Western Europe and let Red Army take Berlin.

March 31, 1945: General Eisenhower broadcasts a demand for the Germans to surrender.

April 12, 1945: FDR dies. Harry Truman becomes President of the US.

April 19, 1945: New form of budget planning in White Paper to accompany the budget next week, entitled "The Sources of War Finance and Estimates of the National Income and Expenditure". The Times expects upcoming budget to "come near to the dividing line between war and peace in Europe" with "a gradual reduction of war expenditure". (TT, pg. 5)

April 25, 1945: Budget is an interim one, with promise of a further budget within the current year. CoE (John Anderson) talks of war expenditure reduction but can only be made once the war is over. War expenditure through Vote of Credit, estimated at £4500 million for 1945-46. (TT, pg. 6-7)

April 30, 1945: In an analysis of the interim budget, The Times writes: "The whole picture, therefore, must change vastly and rapidly as soon as war expenditure begins to contract". (TT, pg. 5)

May 7, 1945: Election is coming up in June. Labour Party announces its Government plan, "which would entail a great deal more Government expenditure in the post-war years. Taking a rough estimate for these and the probable extra expenditure on assisting the rehabilitation of our colonies and dependencies and of other countries through Unrra, together with an extra expenditure on our defence forces, Government expenditure after the war would not fall short of £2,000,000,000, or double the pre-war figure at 1938 prices". (TT, pg. 2)

£2bn in 1938 prices is about £3bn in 1945 prices, using quarterly CPI data made available by the Bank of England.

May 8, 1945: Germany surrenders unconditionally to the Allies on May 7th. V-day in Europe on the following day, where the ceasefire takes effect.

June 9, 1945: Vote of Credit of £1750 million approved by HoC. Daily rate of war expenditure at £12.25 million, but COE says that "these figures could not be taken as a reliable guide of future expenditure, about which it was hoped that more would be known when the House was asked for a further Vote of Credit in October" Article suggests that there will be savings on defense spending in 1945-46. (TT, pg. 4)

June 16, 1945: Discussion about the future of defence policy in the UK in a report by the Select Committee on National Expenditure. The report "calls for a programme of national defence and expenditure which shall secure a unity of purpose between research, manufacture, and war-like requirements. The quantitative requirement is a sizable core of industrial capacity capable of immediate conversion when hostilities break out and a broader plan to enlist the rest of industry in firm, successive stage". (TT, pg. 5)

June 19, 1945: UK begins demobilization.

Defense news shock: savings on defense spending as Germany capitulates and Allies win the war in Europe.

1945Q2: PDV = - £500 million

July 27, 1945: Labour has "sweeping and unexpected victory" in the election, and Clement Attlee becomes PM after Churchill resigns. (TT, pg. 5)

Atlee replaces Churchill at the Potsdam Conference, and Potsdam declaration is issued, where Allies call for the surrender of Japan.

August 15, 1945: Japan surrenders unconditionally after atomic bombs are dropped in Hiroshima and Nagasaki.

August 22, 1945: New CoE (Hugh Dalton) announces new budget to come in autumn and warns against "extravagant expectations of tax relief". (TT, pg. 4)

Defense news shock: Now that war is definitely over, even though there is no recent forecast of what defense spending will be in a post-war year, the Labour Party, which won the election with Clement Attlee in July, is now in power and had announced a post-war budget of $\pounds 2.7bn$. It is reasonable to assume that the defense component of the next budget will still be very large, as war contracts are still not fully cancelled and British forces are still demobilizing. Assuming non-defense spending of about $\pounds 1bn$, this puts defense spending at about $\pounds 1.7bn$.

1945Q3: PDV = - (3000 - 1700)/1.0243 = - £1269.2 million

October 11, 1945: Additional Vote of Credit of £2 billion approved by HoC. This is bigger than any previous VoC and is intended to cover war expenditure until the end of 1945-46 (until March 31, 1946), so that additional VoC before that date will not be necessary. Additionally, "the Government have already decided not to ask Parliament for any further Votes of Credit after the end of the present financial year". (TT, pg. 4)

October 22, 1945: "Six months ago the ex-Chancellor of the Exchequer explained how impossible it was to take a view of the financial future before the smoke of battle had cleared away. The smoke has cleared now, and the one thing plainly in view is that expenditure is still continuing substantially at the war-time rate - \pounds 11 million a day for fighting and supply services - and the \pounds 2.3 billion Budget deficit provisionally estimated by Sir John Anderson in April is not likely to be much improved upon, if at all". (TT, pg. 4)

October 24, 1945: "I have received from the spending departments estimates which suggest that the total issues out of the votes of credit during the year will come to a sum of £4,500,000,000. Here there is a question of plus and minus. There is a probable saving of some £200,000,000 on defence and supply departments. [...] Looking forward to the next financial year, the Committee will not expect six months before the normal time to say much about these prospects in detail. Much will depend for 1946-47 upon the defence expenditure, and this in turn will depend upon decisions of policy which will have to be taken over the next 18 months". (TT, pg. 6)

October 25, 1945: In budget proposals, CoE (Hugh Dalton) announces end of Vote of Credits after the current financial year. (TT, pg. 6)

October 26, 1945: "The main points of criticism [on the budget] were covered by Mr. Dalton's predecessor, Sir John Anderson, in the debate. He was concerned primarily over the absence of evidence that the Government were showing any drive in pruning defence expenditure [...] Mr Dalton was right, for example, in arguing that the quicker the demobilization of the services and the quicker the termination of war contracts, the greater would be the burden of expenditure falling on the current financial year." (TT, pg. 5)

February 8, 1946: "From the end of March onwards defence expenditure - which since 1939 has included all manner of subsidies, trading activities, and other matters somewhat outside the province of the armed forces themselves - will be borne by the ordinary Estimates and no longer by the all-embracing Votes of Credit, which have virtually eliminated Parliamentary and even Treasury control of national expenditure". (TT, pg. 4)

February 22, 1946: Government issues statement on defense policy, providing broad picture of prospects of demobilization throughout the year, with the aim of reducing total manpower to 1.9 million by June and 1.1 million by the end of 1946. However, there is still a lot of uncertainty as "it is too early to settle the permanent strength of the forces, both because Britain's responsibilities in the United Nations Organization are not yet clear and because atomic fission and other technical advances imply eventually a 'fundamental reorganization' of forces, a nature of which cannot yet be foreseen".

On the expenditure side, "the direct cost of the recent war and of defence will still be heavy, though falling", with the recent defence White Paper estimating military spending for 1946 at £1.667 billion, almost exactly half of total government expenditure at £3.44 billion. However, £576 million of the total military spending if given claimed by "terminal charges" (war gratuities and payments for cancellation of war production contracts), while the running cost of military services will be of £1.091 billion. (TT, pg. 5)

Defense news shock: defense spending for 1946-47 is about what was expected in 1945Q3. Given general uncertainty in the medium-term geopolitical scenario, safe to assume that British forces will remain around 1 million and defense spending around £1 billion until 1948, which is about the spending for 1946-47 on military services, excluding "terminal charges".

June 5, 1946: "Opening the two-day debate on foreign affairs in the House of Commons yesterday, Mr. Ernest Bevin, the Foreign Secretary, declared that the British Government's basic aim was to make the United Nations Organization work effectively". (TT, pg. 4)

June 20, 1946: "Reporting to the House of Representatives today on his mission to London, Mr. Chifley said he had informed the United Kingdom Government and the other Prime Ministers that Australia recognized that henceforth she must make a larger contribution to the defence of the British Empire". (TT, pg. 3)

October 5, 1946: White Paper on "Central Organization of Defence" released, announcing creation of the Ministry of Defence, "responsible to Parliament for certain subjects affecting the three Services and their supply", while the PM retains "supreme responsibility" over defence. (TT, pg. 8)

October 9, 1946: Discussion in the HoC about British nuclear arms policy, as the Attlee administration decided to develop the atomic bomb through the Atomic Energy Bill: "The task of developing atomic energy could not be undertaken except by the Government. A large expenditure in money and materials was involved; there was uncertainty about the results and dangers of disastrous action if there were uncontrolled experiments". (TT, pg. 8)

Dockrill (1988) mentions that, with the decision to develop atomic arsenal, the Attlee administration attempted to rationalize and impose controls on defense expenditure but that was a hard task. A secret

committee authorized the development of 200 atomic bombs, which was not revealed to the public or Parliament; the costs of the project were buried in miscellaneous estimates.

February 12, 1947: Supplementary estimate for defense on the horizon. White Paper on defense policy also to be released soon. (TT, pg. 2)

February 15, 1947: Supplementary estimate of £70,000,000 for Army and Navy. Thus, total expenditure on defense for 1946-47 is of £1.737 billion. White Paper released outlines gross total defense spending for 1947-48 at £899 million, meaning defense spending is being cut almost by half. White Paper concludes that it will still maintain 1,087,000 troops on the ground for the current year, as "the supreme objective of British policy must be to prevent war. The role of our forces must therefore be to deter aggression while at the same time safeguarding British interests against attack." (TT, pg. 15)

Debate between cutting spending due to situation of economic stress and keeping a strong military force is a current theme in many articles in both The Economist and The Times. Estimates for troops and defense spending for 1947-48 are approx. what was expected a year ago, so no shock.

March 4, 1947: "Even this figure (i.e. army forces over 1 million) will admittedly impose a considerable strain on the country's manpower, but the demand for a return to the old penny-wise and pound-foolish policy of cutting down service estimates must be resisted". (TT, pg. 5)

March 15, 1947: "The £899 millions to be spent on the Forces and Supply in the coming year, when the armed Forces will still be substantially larger than they are scheduled to be twelve months hence, includes a further £118.5 million for terminal charges (including contract settlements and requisitioning compensation) that the requirement for 1948-49 ought to be well under £700 million". (TE, pg. 384)

March 17, 1947: White Paper debated in HoC. Government defends keeping military at the size outlined in the WP so that the war effort "should not be thrown away by an ill-considered jettisoning of defence responsibilities, however admirable may the aim of lightening the national burden". (TT, pg. 4)

FY	1947-48	1948-49	1949-50	1950-51
March 1946	~1000	~1000		
March 1947	899	690	700	700

Defense budget forecasts

Defense news shock: Estimate for 1947-48 within the forecast of approx. 1000m so no shock, but projection by The Economist that spending in 1948-49 will be "well under £700 millions" due to non-recurring expenditure of terminal charges and further demobilization is a negative shock. Thus, I assume that defense spending in 1948-49 is at £690m and remains at ~£700m beyond that year (i.e. this is a "normal year" value, as terminal charges from war contracts come to an end).

1947Q1: PDV = - (899 - 690)/1.0176 = - £205.4 million

April 1, 1947: Actual defense spending in 1946-47 is of £1.653 billion, slightly lower than the original estimate of £1.676 billion. (TT, pg. 4)

April 16, 1947: CoE (Hugh Dalton) announces budget for 1947-48. Defense spending has big reduction, at £0.899 billion, confirming White Paper estimate of February. (TT, pg. 4)

April 18, 1947: At the HoC, CoE says that "there is much scope for reduction in defence expenditure [and] oversea expenditure". (TT, pg. 8)

May 8, 1947: Compulsory military service cut from 18 months to 12 months. (TT, pg. 5)

September 15, 1947: "Government contemplating drastic reductions in defence services". (TT, pg. 6)

This is met by several letters opposing the idea, especially from MPs. An example on September 23 reads: "Both the Navy League's letter and your short article published on September 22 express natural anxiety lst future cuts in men and material, based on arbitrary percentage basis, should cripple our Navy". (TT, pg. 3)

October 22, 1947: White Paper predicted size of Armed forces to be 1,087,000 by the end of 1947-48 (March 31, 1948). However, on August 6, a revised estimate put the forces at 1,007,000 and a new estimate just released expects the figure to be at 937,000 by March 31. (TT, pg. 6)

This is in line with 1947Q1 expectations. No shock.

December 11, 1947: Minister of Defence says in HoC, in response to an MP asking about the rate of cutting forces and that the MoD may be misleading the public: "I think the Secretary for War has already issued an explanation showing the fallibility of some of the reports made and showing the trend of the reduction rather than committing himself to figures". He also mentions that the figures for 1948-49 are not yet fixed and will be outlined in a forthcoming White Paper. (TT, pg. 4)

February 20, 1948: Defence White Paper released: "The total strength of the services will be decreased by 224,000 to 716,000 by March 31, 1949, and total expenditure in the coming financial year will be reduced by about £200 million to £692.6 million". Defence policy "accepts for this country all the obligations and commitments of a great Power, with the duty of maintaining the forces needed to support its international policy and its interests throughout the world, as well as of fulfilling its responsibilities to the United Nations". (TT, pg. 4)

Defence White Paper (Cmd. 7327) says that spending estimates have been "prepared on the assumption that no unforeseen requirements are likely to arise during the year and that present expectations as to the reduction of overseas commitments will be justified". Future policy will be "flexible" as it is contingent on unforeseen economic and geopolitical developments. No indication of whether to expect a further decrease or an increase in spending in the future.

February 26, 1948: "Defence expenditure has already been reduced to a level in next year's estimates which can hardly allow for any appreciable further reduction, and in some respects will have to be increased". (TT, pg. 5)

March 2, 1948: "The maintenance of compulsory service immediately after a war by a Labour Government appeared to be a courageous action, justified by the unsettled state of the world, and the Opposition was therefore loft to issue a challenge on the general question of defence policy". (TT, pg. 5)

March 18, 1948: "Plea for adequate planning" in defense policy by MPs, which is a "vast question mark". (TT, pg. 2)

Brussels Treaty signed by UK, France, Belgium, the Netherlands, and Luxembourg, creating a defensive alliance and "entails [...] the denial of British isolation from the mainland of Europe. [...] It is linked inevitably with American good will and American assistance". (TT, pg. 5)

April 1, 1948: Armed forces at 931,000 men, with estimated reduction being exceeded by 9,000. (TT, pg. 4)

June 28, 1948: State of Emergency declared in the UK over strikes in docks. Meanwhile, USSR is blockading Berlin. "This may turn out to be the gravest days since the war. Strikers in the docks are seeking to blockade Britain as surely as the Russians on the other side of Europe are already besieging Berlin; and the margin of safety in essential supplies is not greatly wider here than in the unhappy German capital". (TT, pg. 5)

July 9, 1948: Communist uprising in Malaya, which at this point was a British colony: "We were confronted with a difficult and grave situation in Malaya which the Government did not minimize. The authorities were mobilizing in all possible ways to defeat and destroy the menace there". (TT, pg. 4)

August 9, 1948: "Tension has risen perceptibly in Berlin over the week-end. This is due to a combination of circumstances". (TT, pg. 4)

August 16, 1948: "It is not yet known whether a just joint arrangement in Berlin without Russian duress is possible. Still less is it known whether there is any use or hope in starting fresh talks with the russians on Germany's future. The wish of the western peoples to come to terms with the Soviet Union, to reduce the tension in Europe, and to lessen the chance of calamitous conflict is strong and sincere [...] The lesson for western policy in Berlin and Moscow can easily be read. It is that everything must be doe which can be done safely to find a way of working together with the Russians in Germany. It is also that nothing can be done safely which would increase Soviet chances of overlordship in Europe, if the Russians were to seek it. The lesson for western policy at home is equally clear. It is that the combination of western Europe for recovery and revival, with American help, is the pillar of safety, and that western differences and hesitations, as well as the economic weaknesses and difficulties of Britain and France, are serious sources of insecurity". (TT, pg. 5)

August 28, 1948: Reduction of 84,800 men in Armed forces over the past three months. (TT, pg. 4)

September 3, 1948: Malayan Government asks British Government to cover all the costs of the emergency. Negotiations are still ongoing, but the UK has offered a £10m compensation for war damages which, according to Malayan officials, "did not represent a fair assessment of their obligations". (TT, pg. 4)

September 8, 1948: "Berlin tension grows." (TT, pg. 4)

September 15, 1948: Government decision to slow down the rate of demobilization. "It is inevitable that the retention in the services of more men than had been expected and the acceleration of the supply of

equipment will now make Supplementary Estimates necessary before the end of the financial year". (TT, pg. 4)

September 28, 1948: Lord Tedder, Marshal of the RAF, says that UK lives moment of "peace with teeth" in "these days of power politics". (TT, pg. 2)

Defense news shock: £10m for Malayan emergency.

1948Q3: PDV = £10m

December 8, 1948: Amendment to National Service Bill passed in the HoC, which goes back on decision to reduce period of conscript service to 12 months. Now, back to 18 months. (TT, pg. 4)

January 27, 1949: 28,000 fewer recruits in 1947-48 compared to previous year. (TT, pg. 2)

February 16, 1949: Defence estimates for 1949-50 is of £799.86 million, a gross increase of £107.5 million in estimated expenditure compared to the previous FY. "Much of the increase will be for an expansion of production, provision of jet aircraft for defence, overhauls of equipment, and modernization". (TT, pg. 4)

"The world is no less divided now than then, but side by side with the old and tried ties of Commonwealth defence a framework has now been fitted together of a joint defence organization for western Europe, with the promise of a wider, if looser, arrangement to span the Atlantic". (TT, pg. 5)

February 23, 1949: Supplementary Army estimate of £55 million presented today. (TT, pg. 4)

February 24, 1949: Supplementary RAF estimate of £16.4 million presented. (TT, pg. 4)

February 25, 1949: "The large supplementary estimates of expenditure for the current year prepared public opinion for a large increase in the estimates for 1949-50 compared with the original estimates for 1948-49. The expectation is duly fulfilled." (TT, pg. 5)

March 4, 1949: "Anxiety about the state of the nation's defences was expressed by Opposition speakers in the House of Commons yesterday. The Government were accused of undue secrecy and of lack of policy". (TT, pg. 4)

FY	1947-48	1948-49	1949-50	1950-51	1951-52
March 1946	~1000	~1000			
March 1947	899	690	700	700	
Feb 1949		760	800	800	800

Defense budget forecasts

Defense news shock: rising tensions with Russia and beginning of the framework under the Brussels Treaty which led to the creation on NATO, requiring a larger defense commitment by Britain. Therefore, there is supplementary spending over the current FY and estimates for 1949-50 are put at £800m, which becomes the new normal.

1949Q1: PDV = 66.4 + 100/1.0168 + 100/1.0168^2 = 261.5 million

April 1, 1949: Outturn for defense expenditure in 1948-49 was £753 million, compared with £693 estimated. (TT, pg. 4)

April 27, 1949: Recruiting for reserves of all three forces fell from 19,633 in 1948Q4 to 14,731 in 1949Q1. (TT, pg. 3)

May 7, 1949: North Atlantic Treaty to be debated in the HoC. (TT, pg. 5)

June 4, 1949: Reduction of armed forces of 23,000 in the past quarter. (TT, pg. 4)

October 6, 1949: First NATO meeting in Washington. (TT, pg. 4)

October 8, 1949: CoE (Stafford Cripps) stated that, due to treaty obligations recently agreed upon under NATO, "there could be no general reduction in expenditure on defence services" and later said that defense spending on 1949-50 would almost certainly exceed estimates "by quite an appreciable amount". Other reasons for this are stock replacement and sterling devaluation. The Times comments that "future financial pressure may likewise force a reconsideration of defence expenditure". (TT, pg. 8)

October 20, 1949: Defence costs being questioned in HoC and under close scrutiny. (TT, pg. 4)

October 25, 1949: PM (Clement Attlee) presents government spending cuts totalling £250 million, "apart from a small saving in defence expenditure". (TT, pg. 5)

Regarding defense spending, he says: "it has been possible to make reductions which, in spite of the effect of devaluation, will produce a saving at the annual rate of £30 million a year, amounting to £12.5 million during the remained of the current financial year. The Government's forecast of future defence expenditure will be announced later when the review of the future structure of the armed forces has been completed". (TT, pg. 4)

The Times comments: "Defence expenditure will be cut, in a full year, by £30 million but only to cancel present over-spending, so that, pending 'decisions about the future structure of the armed forces' this huge bill, containing almost certainly some price for inefficiency, will be untouched". (TT, pg. 5)

Don't consider shock here as no announcement of new policy and cuts are due to financial considerations.

November 11, 1949: "The call which is frequently heard nowadays for savings in defence expenditure arises scarcely at all from the slightest desire in any party to see the country's defences weakened. It is rather a call for efficient spending so that the defences shall be made stronger, not weaker, by economy". (TT, pg. 5)

January 2, 1950: "There is no subject more difficult to bring within the scope of an annual review than that of the defence of western Europe because there is none which has been shrouded in more mystery and secrecy". (TT, pg. 17)

January 27, 1950: Select Committee on Estimates publishes report assessing defense spending and size of military staff. Concludes that much is being done to reduce staffs and say that "small and more or less haphazard reductions are of no value and that a fundamental simplification of the departments' organization is needed". (TT, pg. 2)

February 1, 1950: Defence White Paper will be held back until after the general election. "It will presumably incorporate the decisions made - after a comprehensive review - about the future structure of the armed forces". (TT, pg. 4)

February 9, 1950: MoD (Lord Alexander) defends maintenance of conscription. (TT, pg. 4)

February 23, 1950: Air Chief Marshall Garrod assumes "a continuing (non-cut) gross defence expenditure by this country of some £800 million a year". (TT, pg. 7)

March 7, 1950: Defence White Paper is released and presented by new MoD (Shinwell). Reduction in manpower by 100,000 men but increase in estimates to £780.82 million for FY 1950-51, due to "research and air force needs". (TT, pg. 4)

Defense statement also shows that "no important changes are to be made in defence policy at present in consequence of the comprehensive review recently undertaken by the Government. [...] The conclusion reached was that the existing balance between the forces 'is about right'". (TT, pg. 6)

Clear that spending won't fall any more and that ~£800m is the correct level of "normal" spending.

March 17, 1950: On nuclear bombs, The Times says that "knowledge that these mighty weapons of offence are no longer the monopoly of a friendly Power lends urgency to the cardinal truism about defence. The purpose of the country's vast estimated expenditure upon defence [...] is not to win the next war but to prevent it". (TT, pg. 7)

May 6, 1950: London Conference to take place next week, where a North Atlantic alliance will be discussed: "It is evident that, except insofar as the Powers are prepared to forgo balanced national forces in favour of balanced collective forces, their treaty obligations may involve them in increased defence expenditure. The question then arises of how much they can afford without disturbance of national economies". (TT, pg. 6)

May 19, 1950: NATO established as "a permanent body for Atlantic defence". Discussion of £100m increase in this year's defense budget "to enable us to play our full part under the North Atlantic Treaty". (TT, pg. 4)

June 9, 1950: The £10m assistance from the UK to Malaya has been spent over 1948 and 1949 and with the uprising still going, a "larger amount is necessary". "A strong case, therefore, could be made out for Britain's taking over the entire cost of the emergency in Malaya, to the tune (this year) of £16m". (TT, pg. 6)

Defense news shock: £100m increase per year in defense budget after formation of NATO this year. Assume this carries forward for at least three years. Costs for Malayan emergency are also still under discussion.

1950Q2: PDV = 100 + 100/1.022 + 100/1.022^2 = £293.6 million

Korean War: On June 25th, 1950, North Korea invades South Korea. The US commits forces to fight by June 30, 1950 and by the end of July, General MacArthur asks for the UK to send forces. Military operations have initial success by October 1950, with South Korean allied forces pushing north of the 38th parallel to the Chinese border. On November 9th, 1950, the Chinese enter the Korean War. The US and UK interpret this is a Soviet threat.

July 11, 1950: "...prospect of having to find a still larger place for a defence expenditure within an already overcrowded Budget". (TT, pg. 5)

July 12, 1950: Supplementary estimate for defence of £3.25 million "to meet new defence expenditure arising out of our commitments to Western union defence and a contribution under the Mutual Defence Assistance Agreement to the United States". (TT, pg. 6)

July 24, 1950: Secretary of State for War comments on possible additional defense spending for 1950-51. (TT, pg. 4)

July 25, 1950: "It is now regarded as inevitable that there should be increased expenditure on defence [...] in light of the changed international situation. It may be that an effort will be made to send so token British force to assist in the operations [in Korea]". (TT, pg. 4)

August 4, 1950: Government announces policy of rearmament in light of the Korean War: "The Government announced last night that they are prepared 'in principle' to increase defence expenditure to a total of £3.4 billion over the next three years. The memorandum, handed to the American Ambassador for transmission to Washington, stated that before the aggression in Korea this country was spending £780,000,000 a year on defence. The increases would entail a rise of defence expenditure from nearly 8 per cent of the national income to 10 per cent, and involve heavy dollar expenditure" (TT, pg. 4)

September 13, 1950: Correction to projected increase. Government now to spend £3.6 billion over the next three years "made necessary by the latest new commitments in pay and re-equipment". Level of defense expenditure is likely to continue going forward. (TT, pg. 4)

PM (Clement Attlee), in a speech to Parliament, says that the new increase in defense spending is "the most that can be done without going back to the drastic expedients of a war economy". (TT, pg. 5)

September 14, 1950: Additional cost of defence program to present FY will be met by supplementary estimates of £70 million. Total yearly expenditure under the new three-year defence program will be at a rate of £1.2 billion. (TT, pg. 4)

Defense budget forecasts

FY 1	950-51	1951-52	1952-53	1953-54	1954-55
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Feb 1949	780-800	800	800	800	800
May 1950	900	900	900	-	-
Sept. 1950	1200	1200	1200	1200	1200

Defense news shock: major shift in defense policy as Korean War begins. Government announces budget plans for the next three years but elevated defense spending is expected to continue beyond that. I assume at least five more years.

1950Q3: PDV = $(1200 - 900) + (1200 - 900)/0.02 [1 - 1/1.02^7] =$ £2241.6 million

December 16, 1950: Gift from British Government of another £10m to "meet the cost of raising two new battalions of the Malay Regiment". (TT, pg. 6)

Defense news shock: Malayan emergency cost

1950Q4: PDV = £10 million

January 2, 1951: "The Chancellor of the Exchequer recently permitted himself to hazard that the additional defence expenditure falling on next year's Budget might be about £300 million; defence plans, however, expand continuously, and this figure will probably be larger by April. [...] it may be necessary next year to secure another £350 million". (TT, pg. 5)

January 30, 1951: "Pushed up by rising prices as well as by larger plans, defence expenditure in 1951-52 will be £1300 million, compared with the already large estimate last April of £800 million for 1950-51; and the defence bill will grow. In the next three years together it will be £4700 million. Spending on production for the services will be twice as large in 1951-52 as it was in 1950-51 and twice as large again in 1953-54, the third year of the programme ". (TT, pg. 7)

February 26, 1951: In discussing the new defense programs in the HoC, the CoE says that rearmament will cost "at least £300m a year" over previous estimates. Therefore, £1.2bn a year is a minimum estimate. (TT, pg. 5)

Defense news shock: The new defense program will be more costly than previously expected. If the estimate for 1951-52 is of £1.3bn and the total for the next three years will be £4.7bn, with spending on production doubling each year, spending for 1952-53 will be £1.5bn and for 1953-54 will be £1.9bn (where £1.1bn is the non-recurring maintenance cost of defense). Will probably stabilize at £1.4-1.5bn beyond that.

1951Q1: PDV = (1300 - 1200)/1.018 + (1500 - 1200)/1.000 + (1500	\cdot 1200)/1.018 ² + (1900 - 1200)/1.018 ³ + (1400-
1200)/0.02 [1 - 1/1.02^5]= £1993.9 million		

FY	1950-51	1951-52	1952-53	1953-54	1954-55
Feb 1949	780-800	800	800	800	800
May 1950	900	900	900	-	-
Sept. 1950	1200	1200	1200	1200	1200

Defense budget forecasts

Feb. 1951 1300	1500	1900	1400
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July 24, 1951: Minister of Supply (George Strauss) says that 1951-52 defense spending is likely to reach estimates. (TT, pg. 5)

September 20, 1951: PM (Clement Attlee) announces date of general election for October 25th, putting an "end to uncertainty". (TT, pg. 7)

October 25, 1951: Churchill is elected as PM in general election.

December 7, 1951: PM (Churchill) announces defence policy of his administration, which "revealed much sense of continuity with what his predecessors had planned". Also announces that defence expenditure will fall below estimate this year due to a lag in mobilization, and government will spend less than £1250 million in 1951-52, and "there was nothing surprising in the admission". (TT, pg. 6)

February 22, 1952: Defence White Paper released. Expenditure on defence in 1952-53 estimated at $\pounds 1462$ million, which is $\pounds 38$ million less than the original estimate for 1952-53 of $\pounds 1500$ million (at 1950 prices) when the rearmament program was announced. Amount to be spent in 1951-52 is estimated at $\pounds 1131.5$ million.

The White Paper also points out that, because of various delays, the £4700 rearmament program will take more than three years to achieve. Estimates presented are based upon the hypothesis that the period to complete the program will be extended by one year. (TT, pg. 5)

Defense news shock: rearmament program will take longer than expected. Spending in the current year will be £170m less than previously expected and in 1952-53 is £40m less than previously expected. Safe to assume that spending for 1953-54 will be lower than £1900m as well, so this amounts to about a £250m delay for 1 to 2 years.

$1952Q1: PDV = (1130 - 1300) + (1460 - 1500)/1.024 + (1850 - 1900)/1.0124^2 + (1525 - 1400)/1.0124^3 + (1525 - 1400)/1.024^4 = - \pounds 23.7 \ million$

FY	1951-52	1952-53	1953-54	1954-55	1955-56	
Feb. 1951	1300	1500	1900	1300	1300	
Feb. 1952	1130	1462	1850	1525	1525	

Defense budget forecasts

April 23, 1952: "Overseas military expenditure is likely to increase further in the near future, particularly in fulfilling NATO commitments". (TT, pg. 3)

July 31, 1952: "The Prime Minister [...] said that the Government were now reshaping the original defence programme to bring it into accord with their new assessment of the country's position." (TT, pg. 6)

October 25, 1952: MoD (Lord Alexander) said "that Britain could not afford military security at the expense of national bankruptcy. Because of this he had reviewed our whole rearmament programme to

ensure that we got the best value for out money, and that our whole defence policy was in line with the requirements of modern warfare". (TT, pg. 3)

December 1, 1952: "What the House will be interested to know is what effect these adjustments of the programme are likely to have on defence expenditure. It is already known that in this third year of the programme defence expenditure will be at least up to the Budget estimate of £1,462m and that Supplementary Estimates will be necessary for the Ministry of Supply and the Army. The Prime Minister has laid it down that the defence programme 'must be kept within the limits of our economic strength'. He has also said that had the original programme been allowed to continue in its expanding course after the third year 'the expenditure would have risen enormously beyond our power to bear'. His further statement on the adjustment of the programme to changed circumstances will be eagerly awaited". (TT, pg. 2)

December 5, 1952: Review of defense policy and conclusions will be presented in the upcoming Defence White Paper in February 1953. However, Churchill announces curtailing of defense production and cancellation of contracts "to prevent any substantial rise above this year's high level of defence expenditure": "If the three-year rearmament programme drawn up by the late Government had been carried through in full expenditure on defence at the end-of-1951 prices would have been in the present year over £1,650m and would have risen in 1953 to more than £1,800m. Within these totals, expenditure on production would have been over £725m this year and over £850m next year. Moreover, much of this increased burden would have fallen on the engineering industry, on which we depend so much for the vitally needed expansion of our export trade". (TT, pg. 8)

February 16, 1953: "Defence expenditure eats up more than one-third of the revenue, and this is the Chancellor of the Exchequer's most formidable problem". (TT, pg. 6)

February 20, 1953: Defence White Paper is released: "Expenditure on defence in 1953-54 is estimated at $\pounds 1636$ million ($\pounds 1497$ without American defence aid). This is an increase of $\pounds 174$ million on the original estimates for the present financial year, and $\pounds 123$ million more than is now likely to be the actual expenditure on defence in 1952-53."

Review of defence policy and of rearmament program is now "being carried farther forward with the object of formulating our defence policy in the longer term, given the probably international situation, the country's economic prospects, and the advent of new weapons and techniques [...] but there has been no change in the determination of the Government to put forth their utmost efforts to strengthen the defences of the United Kingdom". (TT, pg. 4)

Defence White Paper (Cmd. 8768) thus concludes that "even with this spreading forward, the load which the defence production programme would place on industry was greater than was compatible [...] The Government then decided that in the interests of true economy as well as of the vitally needed increase in exports, any substantial rise above the high level of expenditure on defence production in 1952-53 was not possible".

Defense news shock: Cancellation of contracts by Churchill administration means that defense spending in 1952-53 is £1,462m instead of £1650m and spending in 1953-54 will be £1,636m instead of £1850m as previously thought. The defense budget is expected to remain at the 1953-54 level. Accounting for inflation, assume that following years until 1960 will see £50m less. This is a rough estimate.

$1953Q1: PDV = (1462 - 1650) + (1636 - 1850)/1.0345 - (50/0.0345)*[1 - 1/1.0345^{5}] = - \pounds 620.9 \text{ million}$

April 14, 1953: "any further significant change in this year's defence budget seems unlikely". (TT, pg. 6)

April 28, 1953: Mau-Mau Uprising in Kenya requires deployment of British forces. Cost is at £3m for this year. No prospect of ending. (TT, pg. 5)

Mau-Mau Uprising, which led to Kenyan Independence, occurred from 1952 to 1960.

Defense news shock: Mau-Mau uprising/ Kenyan Emergency

1953Q2: PDV = £3 million

July 16, 1953: Report on defense costs by The Times. Mentions that it seems improbable that the defense bill will decrease any time soon, and will increase starting in 1955-56 with the taking over of the cost of British forces in Germany at £70-80m a year. (TT, pg. 5)

July 29, 1953: Select Committee on Estimates says that "the effect of the Government's new policy of spreading aircraft and other defence orders over a longer period will probably involve cancellation payments of about £11 million". This is in addition to the other cuts already announced. (TT, pg. 7)

Defense budget forecasts

FY	1952-53	1953-54	1954-55	1955-56	1956-57
Feb. 1953	1462	1636	1640	1640	1640
July 1953		1636	1640	1640	1710

Defense news shock: additional cost of British forces in Germany over 5 years but cancellation of £11m in defense contracts.

1953Q3: PDV = -11 + 70/0.03 [1 - 1/1.02^5] = £209 million

October 5, 1953: "As the need for economy in defence expenditure becomes more pressing the British Army may find it difficult to convince the Treasury that it needs its own atomic arm. Perhaps it has not yet convinced itself". (TT, pg. 9)

December 10, 1953: Spending in Kenyan uprising to cost £11m more (£6m in emergency costs and £5m in a further grant). (TT, pg. 8)

Defense news shock: Kenyan emergency

1953Q4: PDV = £11 million

January 29, 1954: "It would be true to say that there had been demands in the Press and elsewhere for elucidation on Government defence policy in recent months and weeks". MoD says no alteration in policy. (TT, pg. 5)

February 19, 1954: Defence White Paper released. Defence budget for 1954-55 is at £1640 million, almost equivalent to that of 1953-54. However, change in direction of defense policy: "greater emphasis will be given to the RAF, and the size of the Army will be reduced. Delivery of atomic weapons to the forces has begun". (TT, pg. 8)

In another article analyzing the WP, The Times says that British defense policy is "at a crossroads" in terms of conventional vs. atomic warfare. (TT, pg. 9)

March 19, 1954: "Idle to hope, heavy though the burden is, for any substantial reductions in defence expenditure for some time". (TT, pg. 10)

June 12, 1954: Kenyan Finance Minister estimates emergency costs for the next three years at £21m. (TT, pg. 5)

Defense news shock: Kenyan emergency costs

1954Q2: PDV = 7/0.0282 [1 - 1/1.0282^3] = £19.9 million

June 25, 1954: UN Disarmament Commission discusses limits to military spending through budgetary control. USSR refuses to discuss it until all parties agree to immediate prohibition of atomic weapons. (TT, pg. 6)

October 28, 1954: MoD (Harold Macmillan) says that "additional amount that would fall on defence budget in terms of money in the foreseeable future as a result of keeping our troops in Europe, was not large" and that "the acceptance of new commitments did not itself impose a direct addition to defence expenditure at the present level".

The Times concludes that paying for forces in Germany and other parts of Europe will constitute a significant increase in the defense budget. Forecast that it will be a quarter of the current spending by Germany on allied forces, which is £50 million a month. Thus, increase of £150 million a year (12.5*12) minus £67.5m as contribution by Germany. (TT, pg. 8)

This is already included for in the latest estimates.

January 11, 1955: Upcoming defense estimates will have information on research spending on atomic project. (TT, pg. 9)

February 18, 1955: Defence White Paper is released. Announces Britain's ability to produce thermonuclear bombs and the government's "duty to proceed with their development and production". Mentions development of guided missiles, ballistic rockets, and Defense spending estimates for 1955-56 is of $\pounds 1640$ million, lower than for 1954-55.

Under-spending on defence production of £600 million (similar to last year). Nuclear production is still embryonic. (TT, pg. 8)

July 4, 1955: "One thing seems certain. The cost is going to increase during the next few years". RAF share of defense spending to continue to grow in order to improve air defence, and Army and Navy also have "important demands".

"If we assume than an annual defence expenditure of ± 1500 million, or its equivalent in purchasing power is about as much as the country can stand, the bulk of the money will have to come from economies within the Services". (TT, pg. 9)

September 16, 1955: Talk on cuts in defence through reducing period of military service. However, might have to increase pay as a result so proposal is not so effective. The Times mentions that "there are signs of some fairly ruthless in-fighting behind the scenes over how defence expenditure should be allocated". (TT, pg. 9)

September 20, 1955: "Some reduction is expected in the amount of defence expenditure, and this will help much - if it can be done without impairing western defence". (TT, pg. 9)

October 10, 1955: Services cut by 100,000 men and government is considering better pay and conditions to attract regular recruits. (TT, pg. 8)

"The reason for the cut in the Forces is obviously economic". (TT, pg. 9)

November 3, 1955: MoD says that Government "not committing themselves to large and wholesale expenditure until that expenditure could be based on proper scientific knowledge". (TT, pg. 4)

January 18, 1956: "Reduction in orders for frontline aircraft. [...] as part of the general consideration of defence expenditure, the composition of the aircraft programme is under review ". (TT, pg. 8)

January 19, 1956: PM (Anthony Eden) in HoC: "I have made it clear that we will not reduce expenditure on defence so as to endanger our national survival or our authority in world affairs". (TT, pg. 5)

January 23, 1956: Upcoming Defence White Paper. Main points are reduction or eventual abolishment of national service in favor of smaller, regular forces and build up and maintenance of nuclear arsenal. General impression is that total defense spending will remain similar to that of 1955-56. (TT, pg. 6)

January 27, 1956: Heavy cost of British forces in Germany will have positive effect on upcoming defense estimates. Estimated annual cost of maintaining forces in Germany is between £70 million and £80 million. (TT, pg. 8)

February 18, 1956: Defence White Paper released. Estimates for 1956-57 are at £1549 million. £50 million in appropriations to cover cost of British forces in Germany not included (starting in May when current agreement expires). Big change in defense composition: smaller forces with more powerful and expensive weapons. Overall, somewhat similar expenditure. (TT, pg. 6)

Costs for Germany army already expected and accounted for in 1953Q3. Reason for defense cuts is not change in policy but due to financial constraints so assume no shock.

March 28, 1956: Emergency in Cyprus (currently a British colony), due to insurgent campaign by Cypriot militant group EOKA. Grant for costs of local British forces of £750,000. (TT, pg. 10)

April 2, 1956: Actual defense spending in 1955-56 fell £99 million below the estimate. (TT, pg. 6)

Defense news shock: Small positive shock of Cyprus uprising. Spending being below estimate is due to cuts as a result of financial/economic considerations, so no shock.

1956Q1: PDV = £0.75 million

April 20, 1956: Discussion amongst MPs in HoC. Frequent mention of defense spending being £1500 million a year. (TT, pg. 3)

June 1, 1956: Germany agrees to negotiate support costs for British troops. (TT, pg. 8)

June 11, 1956: Talks about savings on defense: "Mr. Macmillan (CoE) is already conducting a vigorous search for a saving of £100 million in Government expenditure this year, and will probably require the three Services and the Ministry of Supply to find about half of this". (TT, pg. 11)

June 19, 1956: £50 million cut in defense spending to be announced in the next few weeks, through postponement of current production, cuts in defense spending in civil departments, and by economies within the three forces. CoE (Macmillan) talks about halving expenditure, to which The Times mentions: "There seems little doubt that the Government will try to make radical defence economies in the next year or two, for which changes in defence policy will be necessary, but the Chancellor's pipe-dream will still remain a pipe-dream". (TT, pg. 10)

June 27, 1956: £50 million cuts in defense spending for 1956-57. (TT, pg. 10)

Cuts in defense spending are not due to change in defense policy, but the reverse: defense policy is being changed to accommodate budget constraint. Therefore, I do not consider this a shock.

July 20, 1956: The Times criticizes growing pressures for cuts in defense spending: "It is in fact, nonsense for Britain now to talk of 'economic reasons' for reducing defence expenditure. What is essential for defence must be paid for. [...] We do not devote enough of our resources to capital investment. If we cut down on our defences solely to preserve a high standard of living, we shall eventually find ourselves deprived of any power to have a foreign policy at all". (TT, pg. 11)

July 24, 1956: PM (Anthony Eden) denies further substantial cuts in defense spending. (TT, pg. 8)

August 10, 1956: Suez crisis ongoing. Government has not yet reconsidered £50 million defense cuts. PM calls for Cabinet meeting to discuss crisis. (TT, pg. 8)

Suez Crisis from October - November 1956, where UK, France, and Israel invaded Egypt following blockade of Suez Canal by Abdel Nasser. Political pressure from the US, USSR, and United Nations led to withdrawal of forces. This was a big political blow for Anthony Eden, who later resigned.

October 10, 1956: CoE (Harold Macmillan) says that "the Suez crisis has, of course, involved us in extra expenditure, of which we do not know the end". (TT, pg. 4)

October 19, 1956: Change in MoD. Walter Monckton resigns amidst Suez crisis and Anthony Head takes over. Long-term defense policy to be considered in light of advent of nuclear weapons and Suez crisis. (TT, pg. 9)

December 11, 1956: Discussion on impact of Suez on British long-term defense policy: "The military implications of Suez, of Britain's no longer being a 'great power', are being freely argued. It is asserted by some that Suez has shown that Britain can no longer take independent action on this scale, and that therefore she no longer needs to keep conventional forces capable of sustaining such an operation [...] (but) it would be unrealistic, to say the least, to assume that direct military action will never be needed again by Britain in any circumstances".

Talks of further defense cuts, where the Cabinet's review of defense policy "on this occasion really will have to show savings in our technical and manpower resources". (TT, pg. 11)

January 10, 1957: Anthony Eden resigns as PM due to poor health and controversy amidst Suez crisis. (TT, pg. 8)

January 11, 1957: Harold Macmillan becomes PM. (pg. 8)

January 14, 1957: Macmillan announces new cabinet. Duncan Sandys named as MoD. Sandys is given greater powers as MoD and is ordered to draw up defense policy that will substantially reduce spending and manpower. (TT, pg. 9)

January 28, 1957: After failure at Suez, Opposition (Labour) urges government for debate on defense policy in advance of the publication of the annual Defence White Paper. Debate will be held in HoC. (TT, pg. 8)

January 29, 1957: Cost of military action in Suez published at £35 million. Offsets savings by two thirds. Total defense spending in 1956-57 is expected to be £1540 million. (TT, pg. 8)

Defense news shock: Military costs of Suez crisis. Assign to 1956Q4.

1956Q4: PDV = £35 million

February 11, 1957: Further grant to cover costs of local British forces in Cyprus emergency of £3.885 million. (TT, pg. 7)

Defense news shock: Military spending due to Cyprus emergency.

1957Q1: PDV = £3.9 million

February 14, 1957: MoD (Duncan Sandys) says that Government will announce "very difficult and awkward decisions" regarding defense. Unlikely it will be large increase in spending, but reshaping of policy towards larger nuclear arsenal. (TT, pg. 8)

February 15, 1957: British proposal for reduction of British forces in European continent to NATO, in order to "retrench upon her defence expenditure". (TT, pg. 8)

April 1, 1957: Outturn for defense spending in FY 1956-57 at £1525 million. (TT, pg. 17)

Makes sense when taking into account £50 million cut and Suez costs of £35 million.

April 5, 1957: Defence White Paper released. Estimates defense spending for FY 1957-58 at £1483 million. Forces to be cut by 375,000 and nuclear stock to be significantly increased in "biggest change in military policy ever made in normal times". Important recognition that Britain cannot be defended against nuclear attack and therefore "the overriding consideration in all military planning must be to prevent war rather than to prepare for it".

Mention that if previous year's defense policy was continued, spending for this year would be around ± 1700 million, so this is a ± 217 million cut on what was previously forecasted. (TT, pg. 5)

Defense news shock: this is an actual change in policy, as part of the five-year plan put forward by the Ministry of Defence. It is in line with the beginning of the post-Suez era in British foreign policy, which saw less foreign interventionism and a gradual diminution of the British Empire. Due to costs in recessions, expectations have already shifted to a defense budget around £1600m but I assume £100m less a year for the next five years.

1957Q2: PDV = -100/0.048 [1 - 1/1.048] = - £435.4 million

FY	1957-58	1958-59	1959-60	1960-61	1961-62
April. 1957	1483	1500	1500	1500	1500

Defense budget forecasts

October 1, 1957: British proposal for reduction in forces in Germany met with strong opposition from Supreme Commander of NATO, General Norstad in a report on military requirements and defense aims. Article also mentions that without present reductions in defense spending, it would have risen possible to £2000 million year. (TT, pg. 8)

October 11, 1957: Need for international instead of national defense system recognized by MoD (Duncan Sandys). However, "if Britain accepts the benefits of international defence under the North Atlantic Treaty Organization, she must also pay heed to the military requirements of General Norstad. (TT, pg. 11)

November 7, 1957: "It is possible that by sharing our defence and arms and responsibilities throughout NATO, the Government are hoping, not exactly for absolute economies other than those already outlined in the White Paper on defence, but to get far better value for money spent in this field". (TT, pg. 12)

December 17, 1957: "This endless quest for security at any cost is bound to seem a little unreal to people in Britain after the blunt admission of this year's Defence White Paper that at the present there is no means of adequately protecting them against nuclear attack". (TT, pg. 9)

General sense that there is an unwillingness to ramp up defense spending in Britain due to economic constraints and heavy opposition from the Labour Party.

January 6, 1958: PM (Harold Macmillan) suggests pact of nonaggression with the USSR as part of a plan to reach a disarmament agreement. (TT, pg. 5)

January 10, 1958: German Federal Government refuses to budge on British request to pay for £45 to £50 million of a total of £175 million in support costs for British troops in Rhine Army. £125 million is covered by defense budget. (TT, pg. 6)

January 24, 1958: New CoE (Heathcoat Amory) sworn in in HoC. Says that defense spending "causes [him] great anxiety". (TT, pg. 10)

January 27, 1958: "The level of defence expenditure during the coming year will probably be about the same as, or slightly lower than, the present year's. Even the same amount of money, however, will buy less defence, first because of inflation and secondly because a good deal of money is likely to be spent in cancelling defence contracts". (TT, pg. 8)

"[German] Federal Government does not intend to pay support costs in the next financial year to Britain and other allies with troops stationed here. [...] Both Governments are awaiting the results of further considerations in NATO but the determination not to pay seems to be hardening here". (TT, pg. 8)

January 30, 1958: Defence spending in current FY is exceeding estimates by 2%, which is about £25 to 30 million. Supplementary estimate to be expected in February. In January, new CoE (Amory) announced that total supplementary estimates for entire budget in FY 1957-58 would amount to about £100 million. (TT, pg. 8)

January 31, 1958: Removal of 8,500 British troops from Rhine Army in Germany for FY 1958-59 with consent of Western European Union. "No funds are being put aside to meet costs and payment cannot easily be made from the unexpended portion of this year's defence budget". (TT, pg. 6)

February 6, 1958: 5,000 additional British troops can be removed from Germany if the support costs issue is not resolved. "It is now up to NATO to find a way of meeting Britain's claim for financial help, which has been officially endorsed as justified. The interests of the alliance as a whole are affected by this dispute." (TT, pg. 9)

Extra £5.88 million to cover military costs in Cyprus as part of supplementary estimates announced. (TT, pg. 4)

February 14, 1958: Defence White Paper published: defense spending estimated for 1958-59 at £1465 million; Government's plan to end National Service by 1962 still stands; British megaton bombs in production; further cuts in Rhine Army if support costs are not met. (TT, pg. 4)

February 15, 1958: Defense supplementary estimates at £42 million. (TE, pg. 564)

Defense news shock: supplementary defense estimates, including Cyprus operations.

1958Q1: PDV = £42 million

February 26, 1958: Opposition criticism to defense policy in White Paper based on the fact that WP assumes that thermo-nuclear weapons are usable. Argument that nuclear power is not deterrent for conventional aggression and local conflicts of the cold war, and that conventional forces are the real deterrent and should be increased. (TT, pg. 8)

March 24, 1958: Defense estimates for 1958-59 assume that £47 million will be paid by Germany in support costs for Rhine Army troops, and are not included in defense budget, but German government has given no indication that it will be paid. (TT, pg. 8)

March 26, 1958: Anglo-German decision to expand cooperation on military research, development, and production. German defense secretary thinks that Britain is relying to heavily in nuclear power. (TT, pg. 5)

April 16, 1958: Compromise on support costs reached. Germany to pay in installments. (TT, pg. 10)

July 10, 1958: Army supplement of £29.5 million to cover shortfall in German payments of British troops in Rhine Army. RAF supplement of £6 million. (TT, pg. 7)

Defense news shock: Army and RAF supplementary spending due to German support costs.

1958Q3: PDV = £35.5 million

November 25, 1958: US State Department to review military aid policy to Western Europe. (TT, pg. 8)

December 10, 1958: Anglo-American agreement on exchange of defense secrets agreed upon mid-year. Makes defense planning easier and earlier. "Where before it was necessary to explore all likely alternatives, it is now becoming possible to strike a balance between Britain's defence needs for the next 10 years or more". (**TT, pg. 10**)

January 23, 1959: Army strength to be raised to 180,000. (TT, pg. 10)

February 11, 1959: Defence White Paper released. Estimated spending for FY 1959-60 at £1514 million, which is about £50 million more than the estimates for 1958-59 and about £20 million more than the expected outturn for 1958-59. (TT, pg. 6)

June 15, 1959: In article about air defense policy, The Times mentions that "with a fixed defence budget, resources for this can only come from reductions…". (TT, pg. 11)

Expectations that budget is to remain fairly constant at around £1500m a year.

June 19, 1959: Gift of £6.5m to cover cost of Malayan uprising over 1960 and 1961. (TT, pg. 10)

Defense news shock: £6.5m over two years for Malayan uprising

1959Q3: PDV = (6.5/2)/0.042 [1 - 1/1.042^2] = £6.11 million

October 27, 1959: US expected to increase pressure on European allies to pay more towards defense in upcoming NATO meeting. (TT, pg. 12)

November 12, 1959: New MoD (Atkinson). (TT, pg. 13)

December 18, 1959: Atlantic Council meets. France agrees to share in technical discussions on nuclear policy and countries agree on unified air defense. Most importantly, NATO is to have 10-year plan. (TT, pg. 10)

January 5, 1960: Higher pay for Forces likely. Will be announced together with Defence WP next month. (TT, pg. 8)

February 1, 1960: "An increase of more than £150 million in the defence budget for the coming year is likely to be announced in the Defence White Paper in a fortnight's time. [...] A rise in defence costs is not unexpected, but the size of it may well cause surprise. Defence expenditure has averaged £1500 million a year for so long now that this figure, arbitrary though it is, has come to be regarded by many as a fixed ceiling". Reason for the increase in in re-equipping the Army and increases in pay and pensions. (TT, pg. 8)

February 17, 1960: Defence WP released. Defense spending estimates for 1960-61 are of £1630 million, which is £115.7 million higher than the estimates for the previous year. No major change in policy, however, as this constitutes the third year of the five year plan set forth by the Government in 1957. (TT, pg. 6)

March 24, 1960: Supply estimates up by nearly 8% on estimates last year. Only other comparable increase during the past 15 years was due to the Korean War. No sign that supplementary estimates for 1960-61 will be smaller than this year's. (TT, pg. 13)

FY	1957-58	1958-59	1959-60	1960-61	1961-62
April. 1957	1483	1500	1500	1500	1500
March 1960				1650	1500

Defense budget forecasts

Defense news shock: Since articles mention that there has been no major change in policy, as does the Defence WP, I assume that this is a one-off increase.

1960Q1: PDV = 150/1.047 = £143.3 million

April 12, 1960: Independent developments in missile and other defense projects will be cut down severely as it has proven too expensive for British defense budget. (TT, pg. 12)

April 14, 1960: End of Blue Streak (missile). Decision to abandon production due to military purposes, as static launching sites would be vulnerable to attack. Total cost of project will be near £100 million by the time it is brought to a standstill. (TT, pg. 10)

June 3, 1960: Khrushchev proposes three-stage disarmament plan to Western countries, including liquidation of missiles and foreign military bases, banning of nuclear weapons and destruction of stocks, and complete disarmament and prohibition of military expenditure. "Can hardly be acceptable as they stand". (TT, pg. 14)

July 14, 1960: Army will not reach its minimum recruiting target of 165,000 troops by January 1, 1963, when National Service will be abolished. (TT, pg. 5)

August 29, 1960: MoD (Watkinson) reaffirms of commitment to keep defense strong. No defense "on the cheap". (TT, pg. 6)

October 17, 1960: Talks on defense by Cabinet ministers. MoD (Watkinson) asks to keep demands for next year at this year's level (£1600 million). Also mentions projection of defense costs into the future. (TT, pg. 12)

November 18, 1960: Upcoming review of NATO contributions towards defense and economic aid, as well as overseas spending due to current US balance of payments difficulties. British military overseas spending has risen in past two years. UK not expecting calls for more assistance. (TT, pg. 11)

Defence news shock: Several articles now mention ± 1600 million as the fixed defense budget level. Update forecasts for the remaining year of the five-year defence plan.

1960Q4: 100/1.056 = £94.7 million

February 9, 1961: Supplementary estimates on colonial defense. Congo emergency accounts for addition of £2.5 million. Military expenditure on Cyprus is another £5 million. Further assistance to Malaya and Nigeria amount to £2.6 million and security measures in other dependent territories to cost £1.5 million. (TT, pg. 9)

Thus, total supplementary costs of colonial defense at £11.6 million.

February 15, 1961: Defence WP released. Estimate for defense spending in 1961-62 at £1656 million, which is £39.3 million more than estimates for 1960-61.

March 23, 1961: Kennedy asks for "fresh start in foreign aid", including long-term planning and financing among other proposals. (TT, pg. 12)

Defense news shock: unforeseen costs in colonial defense plus defense budget for 1961-62 higher than expected.

1961Q1: 11.6 + 56/1.054 = £64.7 million

June - November 1961: Berlin Crisis

June 23, 1961: CoE (Selwyn Lloyd) says Britain must reduce overseas spending, particularly military spending, due to budgetary concerns. (TT, pg. 12)

July 25, 1961: CoE states that "I intend to do my utmost to keep this increase [in Supply expenditure] at a level not more than 2.5% in real terms... that is to say, about £125 million above the Estimates for 1961-62". (TT, pg. 5)

Defense news shock: £125m increase expected for next year's defense budget.

1961Q3: PDV = 125/1.06 = £117.9 million

July 27, 1961: CoE requests NATO review of Britain's financial burden in maintaining forces in Europe. (TT, pg. 3)

October 19, 1961: "The MoD is planning radical changes in the structure of the armed forces. They are not likely to be announced before the publication of the Defence WP early in 1961, but discussions in the Government are already well advanced". (TT, pg. 12)

October 27, 1961: "The Defence WP to be published in 1962 will shape that policy for at least five years and among the many factors which will be taken into account, three seem to be basic - the move away from the doctrine of massive retaliation, the strength of the regular forces, and the validity of Britain's strategy of overseas bases. [...] It is plainly impracticable to consider, in the present economic climate, any increase in defence expenditure which would materially affect defence policy". (TT, pg. 3)

December 7, 1961: "The Government are ready to plan a substantial increase in the strength of the British Army of the Rhine if negotiations at the meeting of the NATO council in Paris next week are satisfactory". (TT, pg. 5)

Actually this is just a move to "assign" strategic reserve in England to NATO to balance potential removal of British forces from Rhine Army if efforts to reduce support costs are not successful.

February 8, 1962: Supplementary spending in aviation of £12.4 million, plus £1.5 million in colonial defense, and £0.42 million for space research regarding missiles. (TT, pg. 12)

Thus, total supplementary spending is of £14.42 million.

February 14, 1962: CoE's statement last summer on spending limit at 2.5% in real terms (i.e. £125 million increase in estimates for FY 1962-63 compared to estimates for FY 1961-62) does not apply to supplementary estimates. (TT, pg. 12)

February 21, 1962: Defence WP outlining the next 5 years of defense policy released. Estimates for defense spending in FY 1962-63 are of £1774 million. (TT, pg. 2)

The aim of defense policy going further is to "continue to maintain the security of this country and at the same time to contribute to the defence of the free world through collective alliances without a significant increase in the proportion of national wealth spent on defence". (TT, pg. 11)

March 3, 1962: Army supplementary estimate of £5 million for 1961-62. (TT, pg. 5)
March 6, 1962: Pay increases for Army as supplementary estimates to be paid in two annual instalments of £14 million each. (TT, pg. 5)

March 8, 1962: £0.26 million needed as supplementary spending to pay for increase in marine surveyors. (TT, pg. 5)

FY	1962-63	1963-64	1964-65	1965-66	1966-67			
Pre 1962 DWP	1650	1650	1650	1650	1650			
Feb 1962	1774	1750	1750	1750	1750			

Defense budget forecasts

Defense news shock: total supplementary spending for $1962Q1 = 14.42 + 14 + 0.26 = \text{\pounds}28.7$ million plus $\text{\pounds}14$ million for next FY. Increase in this year's defense budget already accounted for in 1961Q3. However, new Defence WP put defense budget at around £1750m a year. Therefore, £100m increase a year over current expectations.

1962Q1: PDV = 28.7 + 14/1.06 + 100/0.06 [1 - 1/1.06⁴] = £388.4 million

July 6, 1962: Extra spending for the RAF amount to £6.75 million. (TT, pg. 5)

July 10, 1962: Extra spending of £8 million for Army to meet payrolls. (TT, pg. 7)

August 4, 1962: Cabinet ministers discuss estimates of defense spending over the next five years. MoD said that no immediate statement was expected. (TT, pg. 10)

Defense news shock: Supplementary defense spending

1962Q3: PDV = 6.75 + 8 = £14.75 million

October 11, 1962: Kennedy presses German government for bigger defense share. (TT, pg. 10)

January 1, 1963: Polaris missiles (nuclear warheads) will have impact on defence estimates to be released in WP in February. (TT, pg. 10)

January 31, 1963: PM (Macmillan) announces in HoC that Britain will have four or five Polaris missiles. (TT, pg. 12)

February 2, 1963: Navy will get three hunter-killers. (TT, pg. 5)

February 12, 1963: Supplementary spending for Ministry of Aviation is at £13.75 million. Additionally, £3 million in military support to India. (TT, pg. 6)

February 16, 1963: CoE (Maudling) to present his first budget for FY 1963-64. 9.4% increase in budget estimates, with defense spending estimated to cost £1904 million (as stated in Defence WP), which is £130 million above estimates for 1962-63. Estimated outturn for 1962-63 is of £1830 million. However,

although budget increased, "it will not mean a significant increase in the proportion of gross national product devoted to defence - at present a little more than 7 per cent". (TT, pg.)

March 5, 1963: Macmillan and Kennedy agree that British military aid to India against China should be within £21 million. (TT, pg. 10)

March 5, 1963: MoD to have structure similar to Pentagon, with end of Admiralty, War Office, Air Ministry, etc. and consolidation of power under Minister of Defence. All planning to be centralized, with MoD having financial control. Thus, defense budget can be more flexible and long-term projections of defense spending possible. (TT, pg. 10)

On same day, MoD says that "any major reduction in defense costs [is] unlikely as long as British commitments remained broadly as they were today". (TT, pg. 14)

March 7, 1963: Increases in military support for protectorates (Swaziland, etc.) will amount to supplementary spending of £412,000. (TT, pg. 5)

FY	1962-63	1963-64	1964-65	1965-66	1966-67
Pre 1962 DWP	1650	1650	1650	1650	1650
Feb 1962	1774	1750	1750	1750	1750
March 1963	1830	1900	1900	1900	1900

Defense budget forecasts

Defense news shock: Although £14.75 million has already been accounted for in 1962Q3 for supplementary defense spending, account for the remaining unforeseen increase in the current year's defense budget of approx. £31 million plus the increase in the defense budget for the following years, as outlined in the new Defence WP, which indicate that this change is permanent.

1963Q1: PDV = 31 + (150/0.047) [1 - 1/1.047^4] = £566.6 million

April 10 1963: Fall in Army recruiting, indicating that recruiting has levelled out after a significant rise last year. "It is now clear that unless there is another sharp rise in the graph, there is no hope of reaching the figure of 180,000 by April 1, 1964, as forecast in the Defence WP in published in February". (TT, pg. 17)

May 9, 1963: Malaya seeking more military aid due to rebellions. Malayan Finance Minister says "Britain has already agreed to give £1.5 million a year for five years to the Borneo territories [...]. We shall be asking over and above this". (TT, pg. 12)

May 16, 1963: British forces to quit bases in Kenya after it achieves independence. Bases will be handed over to Kenyan Government. No mention of costs/savings. (TT, pg. 12)

May 17, 1963: No satisfactory agreement between Britain and Malaya on sharing defense costs. (TT, pg. 12)

July 17, 1963: "[...] the new [Defense] Ministry will be responsible for a budget not far short of £2000 million a year, for some 400,000 Service men and women, and for about another 400,000 civilians." (TT, pg. 6)

Expectation that defense budget will be at £2 billion for the next couple of years. There is no mention of major shift in policy and this is just an accounting change due to the consolidation of administrations under the Ministry of Defence.

Prime Minister change in October 1963, as Harold Macmillan resigns due to health issues. Alec Douglas-Home assumes as PM.

December 3, 1963: Supplementary estimates for colonial military commitments. £1.3 million needed for security in Singapore, British Guiana, and Swaziland. £1 million needed for Basutoland, Bechuanaland. £3 million needed for Central Africa region/Nyasaland. Total supplements add to £5.3 million. (TT, pg. 6)

December 21, 1963: British contribution for Greek defense as part of Nato support fund. Amount is still undisclosed. (TT, pg. 5)

Defense news shock: supplementary spending of £5.3 million for colonial military commitments (plus amount undisclosed for Greece).

1963Q4: PDV = £5.3 million

January 9, 1964: PM (Alec Douglas-Home) predicts reduction of defense spending by both western and eastern countries after disarmament conference: "There is a levelling off in the curve of defence expenditure which we shall perhaps be able to turn down still further when we come to the disarmament conference". Also predicts improvement in east-west relations. (TT, pg. 7)

February 8, 1964: Supplementary spending of £5 million due to defense aid agreement with Malaya. (TT, pg. 6)

February 14, 1964: Defence WP released. Estimated defense spending for 1964-65 at £2126 million, which is an increase of £144 million on the estimates for FY 1963-64. The Times comments: "As recent experience has shown, many unexpected supplementary demands could come in. Britain's peacekeeping operations in various parts of the world are costly." Also, estimated outturn for defense spending in 1963-64 to be £1991, a £9 million increase in the estimates. (TT, pg. 5)

	196	J-64		1964-65	
-	Budget Esti- mates	Esti- mates pre- stated to date	Esti- mates	Esti- mates com- pared with Budget Esti- mates 1963-64	Percent- age increase
Defence	£m.	£m.	£m.	£m.	
Expendi- ture tincludes	1,982	1.991	2,126	+144	7.3
Budget)	(1,838)	(1,841)	(1.999)	(+161)	(8.8)
penditure	4.157	4,281	4.423	+266	6.4
Total Estimates	6.139	6.272	6.549	+410	+6.7

February 21, 1964: Russia attacks British increase in military spending at Geneva Disarmament conference, and calls for a 10 to 15% reduction in military budgets. (TT, pg. 10)

February 26, 1964: Foreign Secretary (R.A. Butler) responds to Russian criticism of British military spending, saying that British spending is at 7% of GNP whereas Russian spending is at 13% of GDP, and that the UK had already reduced its defense spending to a limit consistent with safety (i.e. in 1952, defense share of GNP was of 9.2%). (TT, pg. 9)

February 27, 1964: Britain will go ahead with plan to build five Polaris missiles, regardless of whether or not Russia and the US will freeze missile production or not (as discussed at Geneva). (TT, pg. 10)

March 5, 1964: Supplementary spending in Kenya and Cyprus of £248,000. (TT, pg. 7)

FY	1963-64	1964-65	1965-66	1966-67			
Pre 1964 DWP	1982	2000	2000	2000			
March 1964	1991	2126	2130	2130			

Defense budget forecasts

Defense news shock: supplementary spending on Malaya, Kenya, and Cyprus of £5.248 million plus another permanent shift in the defense budget, primarily due to the Polaris program.

1964Q1: PDV = 5.248 + 126/1.0475 + 130/1.0475^2 + 130/1.0475^3 = £357.1 million

April 13, 1964: "All are persuaded that the present rate of spending on defence - 7 per cent to 8 per cent of the gross national product - represents a fair proportion of the national wealth". (TT, pg. 13)

May 7, 1964: Introduction of long-term financial planning in defense policy by MoD (Thorneycroft). Defence WP for 1965 to include 10-year projection in defense spending. (TT, pg. 14)

July 4, 1964: Supplementary defense spending of £8.5 million in Kenya. (TT, pg. 6)

July 8, 1964: Discussions of an European multilateral force (MLF). MoD thinks that Britain cannot contribute without damaging other defense arrangements. MLF would add £15 million to a £2000m a year defense budget. "The estimated cost [...] might at first seem marginal [...] It is not, however, always fully realized, especially in the United States, that most of Britain's defence expenditure is made up of fixed costs. The room for manoeuvre is limited". (TT, pg. 13)

July 20, 1964: £4 million defense grant for Saudi Arabia. (TT, pg. 8)

August 31, 1964: Britain to remove all troops from Kenya by the end of the year. British military spending in Kenya about £10.5 million a year. (TT, pg. 10)

Defense news shock: Kenya and Saudi Arabia military commitments

1964Q3: PDV = 8.5 + 4 = £12.5 million

Labour Party, under Harold Wilson, win narrow majority in General Election. Wilson becomes PM. Labour Party elected with pre-election promise of reducing defense spending.

October 20, 1964: "cuts [...] are bound to come in defence expenditure". (TT, pg. 8)

October 21, 1964: Army to ask for 20,000 more men. This would increase Army spending by about £20 million, to be executed within two years. But "one of the dominating principles of defence policy in the light of the Labour Government's overall economic policy is likely to be retrenchment. Although Mr. Healey (new MoD) is likely to be in favour of the principle of a strong Army [...] one of his most urgent and important tasks is to reduce the defence budget". (TT, pg. 3)

"It is understood that preliminary calculations show that if the programmes proposed by the outgoing government were allowed to go forward in full the defence budget for the next year would be about £2500 million". (TT, pg. 6)

November 23, 1964: Analysis of possible future defense policy under new Labour government in a report by The Times. Mentions possible request to reduce NATO contributions, reduce troops in Rhine Army and military contribution in Malaya and Aden, and cancellation of weapons production contracts (i.e. aircraft carrier, fighter jets, and TSR 2, "whose future involves military, political, and financial considerations of such complexity that no single aircraft can ever before have provoked"). (TT, pg. 13)

December 1, 1964: Extra spending on overseas military commitments. £25 million in defense costs due to independence process in Malta, under NATO's mutual defense and assistance agreement. £4.3 million in dissolution of Rhodesia and Nyasaland. £1.75 million in security operations in Borneo and East Africa. £2 million defense grant to British South Africa Company. (TT, pg. 3)

December 4, 1964: British negotiations for NATO reconstruction to ensure that new NATO commitments shall not increase Britain's burden of defense spending. Analysis is that US proposals will increase British defense contributions by £15 million a year. (TT, pg. 11)

Defense news shock: £25 million for Malta already accounted for in Nato contribution. Supplementary spending on Rhodesia and Nyasaland, Borneo, East Africa and British South Africa Company.

1964Q4: PDV = 4.3 + 1.75 + 2 = £8.05 million

January 1, 1965: "[...] spending by the Supply Services is well below expectations. This shortfall is thought to be due mainly to lower-than-expected spending on defence and agriculture. [...] however, the final result should be near recent estimates". (TT, pg. 15)

January 11, 1965: Anxiety grows in aircraft industry over uncertainties regarding government's decision on aircraft projects: "Its long-term future would be at stake if all decisions on major military projects proved to be against continuance. [...] There now seems only a remote prospect that the RAF will receive all the 140 TSR 2s they require". (TT, pg. 8)

January 19, 1965: Foreign Secretary (Gordon Walker) says that Britain's aim is to "secure a reduction of defence expenditure without weakening the defence of the country". (TT, pg. 6)

January 25, 1965: Government unable to make decision regarding future of Polaris programme. TSR 2 project also uncertain. (TT, pg. 10)

February 3, 1965: Final decision on TSR 2s will take months. (TT, pg. 15)

February 11, 1965: Government to cancel fifth Polaris. (TT, pg. 10)

February 15, 1965: Government's aim is to reduce percentage of GNP spent in defense by containing annual defense spending to £2000 million a year until 1969-70. However, "rising costs are against them and estimates have been made that by that time, with no actual increase in the size of the forces or the planned level of their equipment, the figure will be £2400 million unless drastic cuts are made". (TT, pg. 11)

February 23, 1965: Defence WP is released. Estimates of defense spending at \pounds 2231 million, an increase of \pounds 104 million compared to FY 1964-65 (i.e. 4.9% rise). Estimated outturn for 1964-65 is of \pounds 2134 million (7 million higher than estimates). Britain to cut forces in Rhine Army. Says it is a saving of \pounds 55.5 million on what would have been necessary to carry out plans of previous administration. (TT, pg. 6)

	1 196	4-65	1965-66
	Budget estimates	Estimates presented to date	Budget
Defence expenditure	£m. 2.127	£m. 2.134	£m. 2.231
Civil expenditure	(1.000) 4,422	(2,000) 4,591	(2 120) 4,903
Total estimates	0.549	0.725	7.134

February 25, 1965: Decision in WP to reduce British forces in Rhine Army shocks Germany. Wish for an opportunity for an "exchange of views" with PM (Wilson) visit next month. The Labour Government says this is an interim report which will be followed by a more complete review of cuts in the next Defence WP.(TT, pg. 10)

March 4, 1965: Government conducting review of use of forces for further cost cutting. (TT, pg. 10)

April 22, 1965: Government set ceiling for annual defense expenditure at £2000 million at 1964 prices. Call for reduction of Territorial Army to achieve aim. (TT, pg. 13)

May 12, 1965: PM (Wilson) speaks at NATO meeting, saying that Britain cannot and does not intend to continue to take "an unfair share of the economic burden of NATO's defence structure". Calls for cut of $\pounds 50$ to $\pounds 100$ million in UK military spending overseas. (TT, pg. 10)

June 16, 1965: Alternative option for defense expenditure policy only to come in the fall. Review of defense budget concludes that commitments made by previous government "involved a cost of between £2450 million and £2500 million when projected into 1969 at 1964 prices". (TT, pg. 10)

July 3, 1965: Extra cost of £264,000 for UN emergency force in Middle East. Extra £357,000 for UN force in Cyprus. (TT, pg. 6)

1965Q3: PDV = 0.264 + 0.357 = £0.621 million

July 18, 1965: Anxiety in US administration over UK defense cuts, especially regarding commitments east of Suez (Middle East and Asia). (TT, pg. 12)

August 3, 1965: Cancellation of TSR 2 contracts and savings on Territorial Army. Drastic cuts to be made to defence estimates. (TT, pg. 8)

August 5, 1965: MoD (Healey) said that defense review aims at keeping 1969-70 budget to £2000 million at 1964 prices. Announces £220 million in cuts, including cancellation of Polaris, TSR 2, cheaper reserve forces, etc. Another £200 million cut needed. (TT, pg. 10)

Defense budget forecasts

FY	1964-65	1965-66	1966-67	1967-68	1968-69	1969-70
Pre '65 DWP	2134	2286	2315	2340	2370	2400
August 1965	2134	2231	2170	2110	2050	2000

Defense news shock: defense cuts that are estimated to be carried out until 1970 by Labour Government. Some of the figures are estimates. Further cuts expected with the full Defence review. We assign this to 1965Q1 as cuts were announced then.

1965Q1: PDV = $(2231 - 2286)/1.067 + (2170 - 2315)/1.067^2 + (2110 - 2340)/1.067^3 + (2050 - 2370)/1.067^4 + (2000 - 2400)/1.067^5 = - \pounds904.4$ million

November 23, 1965: Defence WP, usually released in February, might be delayed by the need for more studies and for consultation with Britain's allies before any announcement can be made. (TT, pg. 7)

December 16, 1965: MoD (Healey) say that NATO has unrealistic goals and Britain "has no intention of meeting them"; CoE (Callaghan) "flatly refused to pay a higher percentage of the NATO infrastructure estimates, which are worked out by a highly complex system for periods of four or five years". (TT, pg. 8)

January 14, 1966: Deteriorating security in Rhodesia, with need for troops to reinforce police force. "It is authoritatively stated that the open-ended commitment in Rhodesia will make spending exceed [£2000 million target] once and for all. The need for battalions in Rhodesia again emphasizes the eternal plight of the defence planners faced with too many commitments for too few troops. The battalions will almost certainly have to come from the Rhine Army". (TT, pg. 9)

January 29, 1966: Britain backs US decision to bomb North Vietnam; reaffirms determination to hold defense spending until 1970 at £2000 million. However, US is convinced that British troops will remain in southeast Asia longer than Healey is expecting. (TT, pg. 8)

The UK decided to stay out of Vietnam, which was a big defense spending shock for the US. It coincides with the period of retrenchment in British foreign policy.

February 12, 1966: Supplementary spending announced. Ministry of Aviation requires additional £12.5 million for research and development; £3.9 million required for Concord project. (TT, pg. 5)

Several articles highlighting disagreements in HoC over defense. Conservatives argue that defense spending ceiling of £2000 million is unrealistic and absurd, while Labour Cabinet and MPs argue it is viable. (TT, pg. 7)

February 23, 1966: Defence WP published: "The estimates for next year provide for an expenditure of £2172 million. After allowing for price increases and certain pay rises of £68 million during the past year, and £56 million for Service pay and pension increases coming into effect on April 1, this is a decrease of £72 million on the 1965-66 defence estimates figure of £2120 million. The defence estimates for 1965-66 were 6.8 per cent of the gross national product; in 1966-67 this proportion would drop to about 6.6 per cent". (TT, pg. 2)

Commitment to keep defense spending under £2000 million in 1964 prices by 1969-70 is maintained; "this means a reduction of £400 million or 16 per cent on what the previous government contemplated for 1969-70. (TT, pg. 6)

Government therefore maintains its commitment to keep spending at £2000m by 1970. To do this, it outlines new defense policy in the 1966 Defence White Paper which was centered in the need to support NATO in Europe and made the commitment that the UK "would not undertake major operations of war except in co-operation with allies. Later in 1967 and 1968, the Government published two further supplementary reviews announcing the strategic withdrawal of British forces deployed east of the Suez. This market the end of British interventionism in its foreign policy, and the end of its world-wide military role.

March 10, 1966: Opposition criticizes Defence WP; says it makes no attempt to match military resources to political commitments, and that it will lead to a growing gap between commitments and ability to meet them. (TT, pg. 4)

All cuts already accounted for in the negative shock in 1965Q1

Defense news shock: Supplementary spending for Concord project and Ministry of Aviation

1966Q1: PDV = 12.5 + 3.9 = £16.4 million

Labour Party wins General Election on March 31st, 1966. Now have a sizeable majority of 100 seats in HoC. Harold Wilson remains as PM.

May 10, 1966: NATO announces cuts to computer air defense. This will reduce UK contribution by £2 to £4 million. (TT, pg. 11)

May 18, 1961: Bigger UK space role urged in document to Government entitled *The Case for a United Kingdom Space Programme*. (TT, pg. 10)

June 16, 1966: PM (Wilson) seeks policy of withdrawal from Malaysia, Singapore, and the Persian Gulf by 1969-70, permitting a saving on the defense budget of more than £250 million a year. Met with fierce opposition from Conservatives. (TT, pg. 11)

June 27, 1966: UK declines to send troops to Vietnam: "Britain's response to confrontation was an example of her defence policy in action". (TT, pg. 8)

July 21, 1966: At least £100 million in savings on defense in 1966-67 announced by PM (Wilson) through reducing costs of forces in Germany and other overseas commitments. (TT, pg. 7)

September 3, 1966: RAF withdrawals from Hong Kong. (TT, pg. 10)

September 10, 1966: "Cuts in defence spending were going ahead, [CoE] said, but only from 1968 onwards could Britain look forward to reductions in overseas expenditure as a result of the Government's review". (TT, pg. 1)

November 1, 1966: Further defense savings overseas will be painful; "The dilemma now facing Britain in its dealings with local Governments is that few more defence economies can be made without changing the political assumptions on which the whole British deployment rests". (TT, pg. 11)

Fi	gures in brack	ets=proport	ion borne on fo	reign exchang	e
-	Germany	Mediter- ranean	Middle East	Far East	Hongkong
Perconnel	£m.	£m.	£m.	£m.	£m.
Equipment	60	15	15	130	10
Buildings	10	5	10	10	1 .
Welfare	10	5	5	10	1 3

November 2, 1966: F111 aircraft deal with US government could cost £43 million more to UK government than originally thought. (TT, pg. 1)

November 11, 1966: "Troop reductions in the Mediterranean, which were planned by the Government during the Defence Review but never announced, have now been brought forward a year to conform with the Government's announcement that a £100 million saving in foreign exchange must be achieved by 1968". (TT, pg. 8)

December 13, 1966: Government spending on overseas aid is to be cut by £20 million in 1967-68. (TT, pg. 10)

February 17, 1967: Estimates for defense spending in 1967-68 at £2205 million. Draws criticism from Labour backbenchers and members of economic and finance group. Said they are unable to support program. This is above the target of £2000 million at 1964 prices. (TT, pg. 1)

"Many of the doctrines enunciated last year have been largely overtaken or invalidated by events. Yet this year's WP hardly goes beyond the point of accepting that the general direction of the Government's policy towards cuts and more cuts in overseas deployment". (TT, pg. 13)

Defense news shock: defense budget for 1967-68 above the forecast that will yield $\pounds 2000m$ defense spending by 1970 by about $\pounds 100$ million.

1967Q1: PDV = 100/1.066 = £93.8 million

July 19, 1967: Another Defence WP released. Cuts in all armed forces. Expectation to stay below the cost of £2000 million at 1964 prices and by 1970-71 to bring it to £1900 - £2000 million. By mid-1970s, a budget of £1800m. Defense cut of £100m for 1968-69. (TT, pg. 3)

Long-term defense budgeting in 1965 and 1966 showed that budget from 1970-71 onwards unlikely to be below £2100 million. Now, expect to stay below £2000 million.

This outlines the Government's view of a "policy of retrenchment outside Europe" which "would enable greater savings to be made (of the order of £150-200 million) in 1970-71, and offered the prospect of a saving on the defence budget as a whole of up to £300 million in 1975-76".

Defense budget forecasts (in current prices, taken from Cabinet Memo: Defence Expenditure Studies)

FY	1967-68	1968-69	1969-70	1970-71	1971-72	1972-73	1973-74	1974-75	1975-76
Feb 1967	2240	2320	2360	2400	2400	2400	2400	2400	2400
July 1967	2240	2220	2210	2200	2180	2160	2140	2120	2100

Defense news shock: negative defense spending. Cuts deeper than previously forecasted.

 $1967Q3: PDV = (2220 - 2320)/1.066 + (2210 - 2360)/1.066^{2} + (2200 - 2400)/1.066^{3} + (2180 - 2400)/1.066^{4} + (2160 - 2400)/1.066^{5} + (2140 - 2400)/1.066^{6} + (2120 - 2400)/1.066^{7} + (2100 - 2400)/1.066^{8} = - \pounds 1271 \text{ million}$

November 21, 1967: "Unless the speed of withdrawal from the Far East is accelerated, and a new offset agreement negotiated with Germany to balance the cost of Rhine Army, Britain's gross overseas defence spending next year will rise, as a result of devaluation, to more than £300m". (TT, pg. 1)

November 28, 1967: £103m defense cut next year. (TT, pg. 1)

Several articles of Conservative criticism to Labour policy of prioritizing defense cuts without having long-term foreign policy strategy.

December 22, 1967: £30 million in Winter supplementary spending for defense required. (TT, pg. 1)

Defense news shock: supplementary estimate of £30 million

1967Q4: PDV = £30 million

February 17, 1968: Spring supplementary estimate includes another £32 million for defense. The Times comments that high supplementary spending "helps to emphasize the facts of life when any Government announce their determination to cut spending programmes". (TT, pg. 1)

Defense news shock: supplementary estimate of £32 million.

1968Q1: PDV = £32 million

March 12, 1968: "The cost of men and their weaponry is constantly rising, so that even without political pressure for defence cuts the maintenance of a fixed manpower ceiling would cause an automatic rise in the defence budget. In addition to this there is a general political disposition to cut the costs of defence, irrespective of party." (TT, pg. 11)

April 20, 1968: PM (Wilson) says that further defense cuts are a delusion. (TT, pg. 2)

July 26, 1968: MoD (Healey) says that when troop withdrawals from overseas commitments are complete in 3 and a half years, "our defence expenditure will be running at more than £250m below the current level." (TT, pg. 6)

August 27, 1968: Russian occupation of Czechoslovakia. Conservative MPs in HoC call for higher defense spending for NATO troops. MoD (Healey) resists, saying no need for panic. (TT, pg. 10)

September 19, 1968: US Secretary of Defense (Dean Rusk) urges build-up of NATO and increased defense spending by European countries. (TT, pg. 4)

September 25, 1968: Britain calls for half of NATO troop reductions by member countries. (TT, pg. 5)

November 1, 1968: Britain to increase contribution to NATO defenses in the next year, "but economies elsewhere will keep spending within the planned defence budget". (TT, pg. 2)

February 4, 1969: "This year's defence budget will be published later this month, and may for the first time record a more substantial economy than any of Mr. Healey's previous four budgets, because the effect of the January 1968 public spending cuts is only just beginning to be felt in defence, and will not be at its height until the manpower reductions haven been completed by the end of 1972". (TT, pg. 4)

February 1969: Defence estimates published for 1969-70, at £2266 million (in current prices), which is £5 million below the 1968 figure. First time in 10 years that the rising trend has been reversed. At constant prices, represent a decrease of £111 million on total for 1968-69. Are also £93 million below target set by PM in statement in January 1968. Under 6% of GNP. (TT, pg. 1)

March 6, 1969: MoD says that further military cuts would imperil security. (TT, pg. 4)

April 10, 1969: Russian invasion of Czechoslovakia makes detentes strategy more complex. NATO calls for small increase in defense expenditure of member countries. (TT, pg. 1)

June 17, 1969: Pay increase in forces will amount to additional allowances of £20.5m this year and will cost £87m a year. MoD (Healey) said economies in other party of the budget are needed to pay for increase. (TT, pg. 8)

October 16, 1969: Riots in Ulster, Northern Ireland, requires British troops to be sent. Healey said that "defence budget will bear the costs of tasks attributable to law and order". (TT, pg. 5)

January 23, 1970: CoE say: "If expenditure on the defence budget between 1964-65 and 1970-71 had increased at the same rate as in the period 1959-60 to 1964-65, the cost in 1970-71 would have been almost £2600 million at 1969 prices - 17 per cent higher than planned defence expenditure in that year". (TT, pg. 19)

January 24, 1970: Public Expenditure White Paper released. Government proposes that cost of defense will fall but about 2.6% annually between 1968-69 and 1971-72. (TT, pg. 7)

The forecast given in the WP is the following:

FY	1970-71	1971-72	1972-73	1973-74	1974-75
Jan 1967	2387	2327	2270	2290	2300

Hard to gauge how this compares to the last forecast because of inflation but since there has been no change in policy and no major announcement of a change in defense costs, I assume that it is fairly similar to the last forecast.

February 14, 1970: Spring Supplementary Estimates announce ± 12.7 million request for defense costs of the British Army of the Rhine (BAOR) after events last year. (TT, pg.)

February 20, 1970: "The Defence Budget Estimates, published yesterday, total £2280m, but the White Paper makes clear that the final figure will be higher than this after a supplementary estimate is presented dealing with the proposed increase in forces pay. The White Paper says that the present estimates, in real terms, are £68m below the forecast for defence spending which was given in last year's Public Expenditure White Paper". (TT, pg. 10)

March 5, 1970: MoD (Healey) says that Conservative plan to keep forces in Malaysia and Singapore would cost an additional £300 million a year. "In fact, the difference between the Labour Government's plans and the plans for 1972 of the last Conservative Government is £1200m on the defence budget". (TT, pg. 4)

March 11, 1970: Relief of £1.82 million for Nigerian civil war. (TT, pg. 4)

Defense news shock: supplementary spending for BAOR, Nigeria, and other military operations of $\pounds 14.52$ million. However, budget estimate for the coming year is $\pounds 68m$ below the forecast for defence spending given in last year's WP, which is fairly in line with our latest forecast.

1970Q1: PDV = 14.52 - 68/1.087 = - £48 million

Conservative Party wins General Election on June 18th, 1970. Edward Heath becomes PM.

July 15, 1970: "[under Conservative government] it is absolutely clear that defence costs will go on rising faster than the budget can rise". (TT, pg. 9)

October 24, 1970: Defense spending to stay at the same level . Defence WP "will show that the Government's proposals for continuing military presence in Singapore and the Gulf can be borne within the Labour Government's limits on defence expenditure". (TT, pg. 1)

October 28, 1970: WP entitled "New Policies for Public Spending". Long-term costing for 1971-72 in defense reduced by £28m to £2327m (equivalent in real terms to level forecast in December 1969 WP). costs for 1974-75 reduced by £132m to £2300m. Government will contain level of defense spending while meeting additional expenditure to be incurred in UK military contribution to arrangements in Southeast Asia, expansion of Territorial army, and reserves. (TT, pg. 8)

Comment by The Times: "The government's Defence WP shows that the defence budget for the next two years will be marginally greater than the Labour defence budgets would have been." (TT, pg. 11)

November 7, 1970: Civil Contingencies Fund to include unforeseen defense budget needs; drops 'Civil' from title.. Extra £75 million allocated to fund. (TT, pg. 5)

November 18, 1970: NATO Secretary-General asks alliance members to increase defense spending by 5% a year in real terms, due to prospect of withdrawal of US forces. European countries are reluctant. (TT, pg.8)

November 20, 1970: "When the Government entered office they found major discrepancies between the forward financial allocations on defence the last Government made in their White Paper on defence and their unpublished long term costings of the defence programme. Defence had to be looked at in the light of the general economic picture. Defence was always a basic responsibility of Government. No one would argue that it should avoid vigorous overhaul at a time when all other domestic expenditure was being reviewed. [...] the defence budget targets were consistent with the estimated costings of the revised programme. And the Opposition been elected they would have had to choose even on their own defence programmes, between increasing their publicly announced allocations or making considerable savings on their unpublished costings. The costings of the Government's policies and programmes had resulted in a figure somewhere between the two. The defence budget targets for 1971-72 would be the same as in the defence White Paper. In 1972-73 and 1973-74 it would be higher, but still less than the costings". (TT, pg. 16)

FY	1970-71	1971-72	1972-73	1973-74	1974-75
Labour targets	2387	2327	2270	2290	2300
Labour costings	2387	2355	2305	2359	2432
Tory forecasts	2387	2341	2288	2325	2366

Defense news shock: In the October 1970 White Paper by the new Conservative government, we see the discrepancy between the costings and targets of the previous government. Since it is said that the Government's policies "resulted in a figure somewhere between the two", I assume that the defense budget for the new Conservative government until 1974-75 will be an average between the budget targets and costing of the previous Labour administration. This is in line with the projection by The Times that defense spending for the next two years will be "marginally greater" than it would have been under a Labour government.

1970Q3: PDV = $(2341 - 2327)/1.07 + (2288 - 2270)/1.07^2 + (2325 - 2290)/1.07^3 + (2366 - 2300)/1.07^4 = £107.7$ million

December 4, 1970: MoD asks for additional £25 million for pay increases. (TT, pg. 2)

1970Q4: PDV = £25 million

February 17, 1971: Supplementary defense estimates released. £25 million required for support of aerospace projects. (TT, pg. 2)

1971Q1: PDV = £25 million

February 18, 1971: Defence WP released. MoD (Lord Carrington) talks in HoC on new UK contributions to NATO (32.5 million to NATO infrastructure) and says that there are "serious deficiencies" in troops in Northern Ireland, which is the government's "most pressing defence priority". Defense estimates for FY 1971-72 are of £2545m (5.5% of GNP), and at constant prices are £1m below the targets published in October. (TT, pg. 1)

February 22, 1971: "Policy decisions on defence spending and external affairs are to come under the scrutiny of a parliamentary select committee for the first time under new arrangements to be announced today". (TT, pg. 3)

March 2, 1971: Minister of State for Defence talks in HoC about need to increase conventional forces in Europe due to 6% increase in Soviet defense spending and the erosion of NATO military strength. (TT, pg. 3)

September 3, 1971: The Times analyzes the current military balance in Europe: "Given the prolonged period of stability in Europe, the western government have found less and less political support for defence spending, particularly among the younger generation. Probably the only army in western Europe with any real semblance of morale is the British Army, which is wholly professional. [...] Amid all these imponderables the Nato powers have to acknowledge that the military imbalance, if allowed to become worse, could become very dangerous. [...] the first need is for the west to use its present defence resources more efficiently [...] The second need is to see if the Russians cannot be rescued from the momentum of their own arms spending by convincing them of the political as well as the economic benefits to be had from controlled and balanced agreements on arms control. If these fail, then the west will be faced with the need for increased armaments on its side". (TT pg. 13)

February 16, 1972: £52 million increase in defense votes (supplementary estimates); due to increase in overseas aid. (TT, pg. 3)

February 14, 1972: Defence WP released. Defense estimates at £2854 million, which maintains steady course of 5.5% of British GNP on defense. Central theme of WP was "continuing threat" from Moscow and crisis in Northern Ireland. "At constant prices these Estimates are £61m above the target published in 'Public Expenditure to 1975-76' (Cmnd. 4829)". (TT, pg. 4)

February 24, 1972: Inquiry about extra cost to defence budget of having forces in Northern Ireland estimates was of £6.5 million in 1970-71 and £11.6 million in 1971-72. (TT, pg. 4)

Assume this has been included in budget increases.

February 25, 1972: Labour opposition to defense budget. MPs call to reduce budget to the NATO average of 4.2% of GNP, which would entail annual savings of £600m on the budget. Heavy opposition from Conservative MPs. (TT, pg. 12)

March 28, 1972: NATO concerns that defense spending of member countries has declined by 3.6% in real terms since 1965, although their gross national wealth has increased by 26%. (TT, pg. 7)

Defense news shock: estimates for 1972-73 are £61m above the standing forecast. Also £52 million increase in defense spending due to increase in overseas aid.

1972Q1: PDV = 52 + 61/1.059 = £109.6 million

July 21, 1972: Total cost of operations in Ulster, Northern Ireland since August 1969 are at £22 million. (TT, pg. 6)

September 29, 1972: MoD announces Royal Navy purchase of cruiser for £62 million. It will be the first of at least three. (TT, pg. 4)

December 6, 1972: Defence budget increasing by 5% in real terms for 1973-74 - "one of the biggest increases to be recorded by European allies in Nato". (TT, pg. 7)

The White Paper published in December 1972 offers new forecasts of the defense budget until 1976-77 compared with the last ones (revalued to 1972 prices).

FY	1971-72	1972-73	1973-74	1974-75	1975-76	1976-77
Previous targets	2804.8	2807	2863	2872	2904	
New targets	2890.7	2842	3009	2892	3015	3000

December 20, 1972: Supplementary defense spending of £184 million presented to Parliament. Include accelerated payment of defense contracts, the extra cost of keeping peace in Northern Ireland, and improved recruitment. (TT, pg. 4)

Defense news shock: Assume cruiser purchase is part of budget increase announced in December. The supplementary spending presented to Parliament include increases in both 1971-72 and 1972-73.

$1972Q4: PDV = 184 + (3009 - 2863)/1.088 + (2892 - 2872)/1.088^{2} + (3015 - 2904)/1.088^{3} = \pounds 421.3$ million

February 22, 1973: Defence WP released, presented by MoD (Lord Carrington) in the HoC. Estimates for FY 1973-74 are at £3365 million, which is a 5.6% real increase over estimates for 1973-74. Surprisingly, the new defense budget did not draw fierce opposition from Labour opposition. (TT, pg. 1)

"At one time the Defence White Paper was a fair barometer of the prevailing climate in the Pax Britannica. Only Northern Ireland is swinging the needle round to "stormy" now". (TT, pg. 17)

May 22, 1973: CoE announces major cuts to public spending for current and next FY. Cut to defense in FY 1974-75 of £50m (in 1973 prices): "The Government expect to maintain the 1974-75 defence budget at about the same level as this year. There will be both economies and postponement of expenditure, including works projects. But the UK contribution to Nato will not be reduced". (TT, pg. 1)

1973Q2: PDV = -50/1.093 = - £45.7 million

December 13, 1973: Russia military budget cuts signals detente with West. (TT, pg. 1)

Bleak state of recruiting, where Army may only get half of recruitment level of 1972. Labour MPs call for defense cuts of £1000 million. (TT, pg. 3)

December 18, 1973: Winter supplementary estimates published. £154 million requested for defense (Northern Ireland and administration costs). Also, defense contribution to total government savings in FY 1974-75 of £173 million, in addition to aforementioned £50 million cut (not a lot is specified). (TT, pg. 3)

1973Q4: PDV = 154 - 173/1.11 = - £1.9 million

February 6, 1974: Labour Party says that £1000 million cut in defense spending will not be the policy if Labour wins the election. (TT, pg. 8)

February 9, 1974: General Election to occur on February 28th. Labour Party is campaigning, and in article outlining proposals, mentions a "promise of cuts of several hundred million pounds per annum in Britain's defence spending". (TT, pg. 15)

Labour Party wins the General Election on February 28th. Harold Wilson returns as PM.

March 13, 1974: Labour government "will seek to make economies by slowing equipment programmes rather than by cutting them". Last government's estimates for 1974-75 at £3418 million, but cuts of £247 million had already been promised last year. Details of further cuts by new government will be in Defence WP which "should emerge in the next few months". (TT, pg. 3)

March 15, 1974: Spring supplementary estimates released. Total of £502 million for Civil and Defence, with over half of it being due to price and pay rises (high inflation in 1974). £120m is for defense. (TT, pg. 2)

March 22, 1974: New MoD (Mason) announces Labour administration's intention to cut defense spending, including contribution to NATO and hints towards withdrawal of 2,700 troops from Singapore. The statement "will cause some unease at Nato and washington, and will reawaken speculation over Britain's commitments elsewhere, including Cyprus and Hong Kong". (TT, pg. 8)

March 27, 1974: £228 million cut reaffirmed for 1974-75 (had previously been announced by previous government). (TT, pg. 2)

April 10, 1974: MoD (Mason) announces cuts are actually at £262 million in 1974 prices. (TT, pg. 14)

May 11, 1974: US Defense Secretary (James Schlesinger) calls on UK and other WE countries to increase share of Nato defense costs for this year and next. (TT, pg. 4)

Several articles highlighting uncertainty over defense spending as White Paper has not been released. Only indication of policy is quote on intention to cut defense spending by "several hundred million pounds" a year. (TT)

November 1, 1974: Defence White Paper delayed until January. (TT, pg. 3)

December 4, 1974: Long awaited defence review released. MoD (Mason) in his parliamentary statement, outlines plan to reduce defense spending by £4700 million in the next 10 years. Proposals should cut £300 million from 1975-76 defense budget, about £500 million a year by 1978-79 and £750 million a year by 1983-84. This will reduce the defence share of government spending from 5.5% of GNP to 4.5% of GNP. (TT, pg. 1)

December 10, 1974: Pay and prices increase on civil and defence expenditure in supplementary estimates total £654 million. Defence makes up 150m. (TT, pg. 4)

1974Q4: PDV = £150 million

February 12, 1975: Pentagon report criticizes British defense cuts. (TT, pg. 7)

February 15, 1975: Supplementary estimates for defence due to pay and price increases. See paper for specifics. (TT, pg. 1)

March 5, 1975: £9.2 million in supplementary estimates for MoD pay and pensions. (TT, pg. 5)

March 6, 1975: NATO asks UK to change proposals of cuts to defense contribution. (TT, pg. 5)

March 17, 1975: Defence WP to be released. Will detail the £4700 million cut announced by MoD (Mason) in December. Estimates will be "in excess of £4000 million, well above the £3700 million for 1975-76 referred to by Mr Mason in his statement. That is because of revaluation due to inflation and to some recosting, and the Government will argue that the figure of £3700 million at 1974 prices is still valid". (TT, pg. 4)

March 20, 1975: Defence WP released. Outlines 10 year cuts; announces reorganization of British Rhine Army; NATO expresses "considerable disquiet" at scale of reductions. Defense estimates for 1975-76 at \pounds 4,548m, which comprises the \pounds 3,700m announces in December at 1974 prices with a \pounds 848m adjustment after revaluation and recosting. Increase is not entirely due to inflation. (TT, pg. 3)

Defense news shock: This is a major shift in defense policy towards an even more limited approach to the role of the British military complex. As this was expected at the time the Labour government was elected, I assign it to 1974Q1. The commitment to reduce the defense budget to 4.5% of GDP over ten years was "founded on the assumption that the UK's defence contribution should move towards the NATO average and precipitated by the economic situation of the UK at the time and a move toward a period of détente in

east-west relations" (Taylor, 2010). Arguable if the review was motivated by budgetary or foreign policy considerations, but I take it into account.

FY	1975-76	1976-77	1977-78	1978-79	1979-80 to 1983-84
Previous program	4000	4070	4150	4300	4450
Defence review	3700	3800	3800	3800	3790
Difference	300	270	350	500	660

Comparison of programs (1974 prices)

 $1974Q1: PDV = (-300/1.124) + (-270/1.124^{2}) + (-350/1.124^{3}) + (-500/1.124^{4}) + (-660/1.124^{5}) + (-660/1.124^{6}) + (-660/1.124^{7}) + (-660/1.124^{8}) + (-660/1.124^{9}) = - \pounds 2516 \text{ million}$

April 16, 1975: Accelerated defense cuts may save £110m for defense budget in 1976-77. The effect is to reduce the projected 1976-77 budget from £3800m to £3690m, "although after revaluation and adjustments the actual estimate will be higher than that". (TT, pg. 4)

September 9, 1975: MoD (Mason) hopes for East-West agreement on troop reductions next year, and rejects call from Labour MPs for a £1300m cut in the defense budget. (TT, pg. 6)

September 27, 1975: US Secretary of Defense (James Schlesinger) warned European members of NATO to increase defense contribution, despite "heavy pressure upon allied governments to reduce defence expenditure in the face of heavy unemployment". (TT, pg. 3)

December 5, 1975: CoE (Healey) pressures for £1300m cut in defense spending over the period of 1977-1980 in addition to the £4700m decrease over the next 10 years already announced. Plea has divided the Cabinet - CoE says it is proportionate to cuts in other departments, but move might lead to Service chief resignations. (TT, pg. 1)

December 9, 1975: Supplementary spending on defense at £251.4m. Estimates for Defence Vote on Account for FY 1976-77 are less than half that of FY 1975-76: £2140m vs. £4755m. (TT, pg. 4)

December 11, 1975: Minister of State for Defence threatens to resign if £1300m cut is approved. (TT, pg. 3)

December 15, 1975: "What alarms service chiefs now however is the scale of the defence saving which Mr. Healey is said to be contemplating. A loss of £1300m from the budget during the period 1977-80 works out at more than £300m a year. This is in addition to the £500m a year which the measures adopted in the Defence Review should be saving the country at that time - and by 1984 the total annual reduction in defence spending should thus be slightly above the £1000m demanded at the Labour Party conference of 1973". (TT, pg. 11)

February 6, 1976: Further cuts totalling £180m to be announced. Will mostly fall on 1978-79 but will start to take effect in 1977-78. "The amount is only a quarter of that originally demanded by Mr. Healey,

the Chancellor, which is being seen as a personal victory for Mr. Mason". Details to be disclosed in Defence WP next month. (TT, pg. 1)

These cuts are motivated by budgetary constraints, so I ignore them.

February 20, 1976: Spring supplementary spending for defense totals at £98.3m. Mostly due to price and pay increases. (TT, pg. 4)

March 18, 1976: Defence WP released. Estimates for 1976-77 at £5,632m. WP announces British reinforcement for NATO's flanks, which comes as a surprise. (TT, pg. 9)

April 2, 1976: Conservative MPs in HoC argue that there is no more room for real cuts in defense spending. Amendment for further cuts in defense spending is rejected. (TT, pg. 8)

June 11, 1976: Labour critics call for £1000m cuts a year. MoD (Mason) says that would have grave consequences for shipbuilding and aircraft industries and that any further reductions, even much smaller than £1000m, would require "savage cuts in the Armed Forces". Mason opposes this, saying it would "lead to a policy at best of neutrality and at worst of surrender". (TT, pg. 5)

July 23, 1976: CoE (Healey) announces further cuts for FY 1977-78. Defence budget to be cut by £100m. Saving to be achieved by rephasing the works programme and by some deferments. (TT, pg. 1)

Again due to budgetary constraints, so I ignore.

September 23, 1976: Conservative review of defense policy asks for defense spending to be exempt from spending cuts. (TT, pg. 4)

December 8, 1976: NATO urges UK to increase defense spending. (TT, pg. 5)

December 11, 1976: Defence chiefs urge PM to halt new cuts to defense spending to be voted next week, in an unprecedented joint meeting. Despite plea, decision seems to have already been taken. (TT, pg. 1)

December 15, 1976: CoE (Healey) announces defense cuts totalling £100m in FY 1977-78 and £200m in FY 1978-79. "They represent the fifth assault on the defence budget during the past 21 months. And the eight the Services have had this decade". (TT, pg. 1)

January 21, 1977: Navy abandons missile improvement program to accommodate £100m cut in defense spending for FY 1977-78. (TT, pg. 5)

February 12, 1977: Spring supplementary estimates released. Defense estimate increased by £80.6 million. (TT, pg. 1)

March 1, 1977: Defence WP published. Cuts for FY 1978-79, previously announced at £200 million, will be of £230 million. After these reductions, the defense budget will be of £5447m for 1977-78 and £5403m for 1978-79 at 1976 prices. (TT, pg. 1)

May 19, 1977: NATO members agree to annual increase in defense spending of about 3% in real terms, for a five-year period starting from 1979. MoD (Mulley) argued that UK could not raise defense spending at all before 1979, and thus pushed start date back to that year. (TT, pg. 8)

All of the following cuts have been due to recessionary impact/budgetary issues so they are all ignored.

September 3, 1977: "The Conservative Party has promised to strengthen the country's defences if it is returned to power at the next election. The Royal Navy and our reserves, particularly our army reserves, represent two areas in need of reinforcement". (TT, pg. 13)

December 8, 1977: Conservative Party calls for a motion in HoC to restore planned defense cut of £267m and honor British pledge to NATO to spend 3% more in real terms per year. (TT, pg. 3)

January 10, 1978: Pledge to raise spending by 3% in real terms for 1979-80 and 1980-81 to be confirmed in upcoming WP on Expenditure. (TT, pg. 1)

January 13, 1978: Numbers for defense budget after 3% rise: 1979-80 planned at £6,466m, which is \pounds 186m more than the \pounds 6,280m for the previous year at 1977 prices. Budget for 1980-81 is \pounds 6,660m, but will be subject to another review next year in light of economic circumstances. (TT, pg. 5)

January 20, 1978: RAF in need of extra base in Germany. Costly undertaking (equivalent base costs £337m plus £36m a year to maintain). Unclear if it will be accepted. (TT, pg. 6)

February 21, 1978: Defence WP released. Budget estimates for FY 1978-79 at £6,919m, "which is 4.75% of GDP, compared with 4.9% in 1977 and 5.1% in 1976". WP says manpower reductions imposed will bring savings between 9 and 10% of the 1974 headquarter's numbers by April 1979. It warns that "the intention is to find still further economies by the early 1980s". (TT, pg. 14)

March 15, 1978: Conservative Party promises to spend more on defense if it wins the election next year. (TT, pg. 3)

Defense news shock: renewed pledge to NATO to raise defense spending by 3% in real terms for 1979-80 and 1980-81.

FY	1978-79	1979-80	1980-81	1981-82	1982-83
March 1978	6868	7178	7394	7420	7420

Forecast with 3% NATO increase (1978 prices)

1978Q1: PDV = (7178 - 6868)/1.1 + (7394 - 7178)/1.1² = £460.3 million

October 13, 1978: In another indication of defense policy, Conservative Party pledges to strengthen the Armed Forces and ensure that British defense policy would be determined by British defense needs. (TT, pg. 6)

General Election held on May 3, 1979. Conservative Party wins the election, and Margaret Thatcher becomes PM.

November 27, 1979: Discussion of potential British purchases of nuclear missiles and warheads from the US: "But can Britain afford a deterrent at all? The Trident-1 package, including the submarines and warheads, which would be built in Britain would cost between £4000m and £6000m, spread over a period of 10 to 12 years". (TT, pg. 12)

December 12, 1979: Thatcher determined to back US proposals for strengthening and modernizing Europe's nuclear defences. NATO members are expected to agree on it. (TT, pg. 2)

December 13, 1979: NATO approved US nuclear plan for Europe, which is to cost £2,500m. Britain's share is expected to be about £35m. (TT, pg. 1)

January 25, 1980: Further discussion about British Trident-1 project, which is forecasted to cost £4000 to £5000 million and spread over a 10 to 15 year period. (TT, pg. 8)

Another article comments on the increased defense spending by the US and USSR: "The immediate prospects are bound to be gloomy. The arms race will continue unchecked. Defence spending will rise. The delicate threads of détente are breaking". Mentions that Carter has full support of the UK in rearming, as assured by MoD (Lord Carrington). (TT, pg. 13)

March 13, 1980: Defense overspending by £64m in FY 1979-80. MoD has to reduce spending in administrative items to compensate. No shock. (TT, pg. 2)

March 27, 1980: Confirmation that the 3% real rise in defense spending will continue for 1980-81 and the fiscal years following. Previous Labour government had committed to 1979-80 and 1980-81 but adopted "wait and see" approach to 1981-84. Conservative administration confirms rise will continue until 1986. (TT, pg. 2)

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FY	1979-80	1980-81	1981-82	1982-83	1983-84	1984-85	1985-86
March 1978	7920	8181	8223	8231	8231	8231	8231
March 1980	8100	8181	8244	8490	8746	9010	9280

Forecast with 3% NATO increase extended to 1984 (1979 prices)

Defense news shock: Conservative Government had pledged to increase defense spending, and end of détente between east and west, and the hawkish stance taken Margaret Thatcher further exacerbate this.

 $1980Q1: PDV = (8100 - 7920) + (8244 - 8223)/1.12^2 + (8490 - 8231)/1.12^3 + (8746 - 8231)/1.12^4 + (9010 - 8231)/1.12^5 + (9280 - 8231)/1.12^6 = \pounds 1681.9 million$

April 2, 1980: Defense WP released. Confirms previous estimates, but there is no announcement regarding the nuclear program to replace Polaris, among other important pending strategic decisions. (TT, pg. 2)

April 29, 1980: "The Government's strategy for economic recovery involved severe restrictions on public spending, but in contrast to the previous Government it was prepared to put defence at the top of its priorities, not because it liked it but because the realities of the international situation made it necessary". (TT, pg. 6)

July 16, 1980: Government announces purchase of the Trident-1 missile system, which will replace Polaris in the mid-1990s. Will cost the MoD £5000m over the next 15 years over the current budget. (TT, pg. 16)

Defense news shock: Trident-I purchase.

1980Q3: PDV = (5000/15)/0.126 [1 - 1/1.126^15] = £2199.4 million

August 12, 1980: "Although no immediate explanation of the high level of expenditure was made yesterday, it is known that the defence expenditure has been running above planned levels. On Friday, it was announced that defence cash limits were to be raised by £203m, but even this will require the Ministry of Defence to rein in its spending which otherwise would be between £600m and £700m higher than planned for the full year". (TT, pg. 1)

October 25, 1980: Pledge to raise defense spending by 3% a year in real terms extended until 1986. (TT, pg. 15)

This was already expected in 1980Q1.

November 3, 1980: Under pressure to devise strategy for cuts in spending due to balance budget, MoD (Francis Pym) puts up strong resistance, saying that he is committed to the NATO aim of achieving 3% real growth in defense spending over the next few years. (TT, pg. 2)

November 6, 1980: Defense spending cuts for 1981-82 likely to be between £150 and £175, which is well below that £500m cut proposed by the Treasury. (TT, pg. 1)

January 16, 1981: Cuts updated to £200m likely to be announced. (TT, pg. 5)

Cut is due to budgetary concerns, so I ignore it.

January 21, 1981: MoD (John Nott) announces defense budget for 1981-82 will be at £12,250m at current prices. This takes the £200m cut announced by the CoE into account, and is £1000m higher than 1980-81 spending in current prices. Likely to exceed 3% Nato aim for 1980-81. (TT, pg. 1)

MoD (Nott) says that UK is to continue 3% real rise in defense spending a year from the revised estimates taking the £200m cut into consideration: "This is not a cut in real terms. It is a cut in a plan." (TT, pg. 9)

January 24, 1981: £35m error in MoD estimates for RAF. Will add £35m to RAF appropriations. (TT, pg. 3)

February 18, 1981: Defense spending will exceed cash limit in 1980-81 by £260m. (TT, pg. 4)

March 11, 1981: Defense budget will be £9750m in 1980 prices for 1981-82. (TT, pg. 4)

Considering annual inflation in 1979-80 was 18%, this value is about the value for 1981-82 in the last forecast, so no shock.

March 12, 1981: Recently discovered and unannounced gap of about £500m between commitments and available resources in long-term costings. 'Some hard decisions on adjustments to present programmes are likely''. (TT, pg. 5)

March 25, 1981: £25m increase in UK aid to Zimbabwe. (TT, pg. 8)

Defense news shock: I ignore budget cuts, and shock is just the unforeseen supplementary spending for RAF, Zimbabwe, and others.

1981Q1: PDV = 260 + 25 = £285 million

May 18, 1981: MoD (John Nott) will meet with PM (Margaret Thatcher) to present plan to cut defense spending by £8000m over the next 10 years. Conservative MPs threaten to revolt if approved. (TT, pg. 1)

May 22, 1981: Final result of defense review is likely to be a £6000m cut in the defense budget over the next 15 years, rather than the £8000 to £10,000m over 10 years previously suggested. (TT, pg. 1)

June 25, 1981: "In spite of government reassurances that defence spending will continue to climb until 1986 by the three per cent as demanded by Nato, the services are bracing themselves for another sharp shock". MoD (Nott) to reveal defense cuts today, but reaffirms plan to continue annual 3% real increase until 1986. (TT, pg. 4)

June 29, 1981: Defense review presented. Long-term costings imply some cuts to defense budget up to 1986 in order to keep it within the 3% annual real growth, as defense costs have been surging above inflation. It is not clear how much growth there will be in the defense budget beyond 1986, but it is unlikely to be more than 1% a year. Long-term costings suggest economies of £350m a year throughout late 1980s and early 1990s if commitments not to outstrip resources are maintained. Program is to strip more than £5000m over 15 years. (TT, pg. 3)

Defense news shock: Cuts to defense emphasize further retrenchment of British foreign policy, although there are also budgetary motivations. Although the plan will take 15 years, with £350m cuts a year, I only consider 10 years ahead (1986-1996).

1981Q2: PDV = - 350/0.128 [1 - 1/1.128^10] = - £1914.5 million

October 27, 1981: The Times analyzes possibility that Thatcher government is thrown off course and does not fulfill its pledge to raise defense spending by 3% a year until 1986. The scenario where the government is "blown off course" assumes an increase of less than 2% a year. (TT, pg. 4)

	DEFE	NCE CH	IOICES I	FOR THE	1980s		1
`		Existing Government programme			The Government blown off course		
RESOURCES Defence bud Defence man	get (£000 millions) power (thousands)	1981-82 12.3	1983-84 13.0	1985-86 13.8	1981-82 12.3	1983-84 12.5	1985-86 12.8
Service perso MoD Civilians	onnel	332 228	324 200	314 198	332 228	320 200	300 195

February 9, 1982: MoD (John Nott) presses for UK to purchase Trident II system instead of Trident I. Trident II costs £6000m over 15 years, compared to £5000m over the same period for Trident I, which was ordered by the British Government in July 1980. Trident I is currently in use by the US Navy but is to be phased out. (TT, pg. 1)

February 18, 1982: Final price for Trident II is likely to be at least £7000m over 15 years. MoD (Nott) likely to be able to persuade Cabinet to adopt it, despite opposition on higher costs by Conservative backbenchers. (TT, pg. 3)

March 8, 1982: Trident II to cost around £7500m. (TT, pg. 8)

March 12, 1982: Cabinet decides to buy Trident II from US. Opposition pledges to cancel program. (TT, pg. 4)

Defense news shock: Trident II implementation, instead of Trident I. £2500m in additional cost on top of what was previously accounted for, over 15 years.

1982Q1: PDV = (2500/15)/0.156 [1 - 1 / 1.156^15] = £947 million

From April to July 1982, the UK fights a war against Argentina over the Falkland Islands.

April 16, 1982: At this point, cost of Falklands War still represents very small proportion of the defense budget of over £14,000m for FY 1982-83 in current prices. (TT, pg. 4)

April 28, 1982: Defence WP released. Final outturn for FY 1981-82 to be very close to cash provision. Over past two years, cash increase of £3400m (£2780m due to inflation; £530m due to real increases). (TT, pg. 6)

May 7, 1982: "The argument, in oversimplified form, is that if Britain comes out on top [in Falklands War], the country will be in a more militaristic mood and the Government will increase defence spending at a faster rate than the 3 per cent a year to which it is already committed." (TT, pg. 6)

May 27, 1982: Cost of Falklands War so far amount to £1000m. So far the cost has been met out of budget but if necessary, the Government can dip into the £2250m contingency reserve. (TT, pg. 3)

June 10, 1982: Treasury is uneasy about rising cost of war: "these costs could amount to several hundred millions of pounds a year". Total this year is unlikely to be above £1000m. (TT, pg. 6)

June 23, 1982: Falklands campaign costs to be met outside of defense budget. Campaign has cost £500m by early June and is expected to add an annual £250m for replacing ships and missiles over the next few years. (TT, pg. 1)

Defence WP is released. Confirms Trident II cost at £7500m over 15 years and reiterates NATO commitment to raise spending by 3% a year. (TT, pg. 5)

June 28, 1982: Falklands costs entail an extra £500m this year and £250m each year in 1983-84 and 1984-85. (TT, pg. 1)

Defence news shock: Falklands War. Cost for the current year will be around £1bn, with £250m each year in 983-84 and 1984-85.

1982Q2: PDV = 1000 + 250/1.126 + 250/1.126² = £1419.2 million

September 30, 1982: NATO Commander calls for increased spending in conventional forces by raising annual expenditure by £10 a person over the next six years. (i.e. around £560 million a year). (TT, pg. 1)

October 29, 1982: Falklands war costs will exceed £1600 by 1986. (TT, pg. 1)

November 9, 1982: Cost of maintaining garrison in Falkland Islands in 1983-84 estimated at £400m out of a projected defense budget of £15,900m. Extra provision of £622m for Falkland costs made for next year. (TT, pg. 5)

November 18, 1982: Margaret Thatcher warns Western alliance to keep pace on its Nato commitment to raise real defense spending by 3% a year. (TT, pg. 7)

December 15, 1982: Government announcement of £1000m spending on replacing equipment destroyed during Falklands war. (TT, pg. 1)

Defense news shock: Additional cost of Falklands war. Previous appropriation for 1983-84 just for replacement of equipment, so this is add £400m for cost of maintaining the garrison for next year. I also add additional cost of replacement: pledge for £250m a year already done for two years so assume this is £500m more for the following two years as article said it would cost "an annual £250m for replacing ships and missiles over the next few years" (i.e. this is cost of replacement for 1985-86 and 1986-87).

1982Q4: PDV = 400/1.1 + 250/1.1² + 250/1.1³ = £758.1 million

February 2, 1983: Defence WP released. Foresees defense spending rising: £14,411m in 1982-83, £15,987m in 1983-84, £17,290m in 1984-85 and £18,330m in 1985-86. The Falklands component is forecasted as following: £642m in 1983-84, £684m in 1984-85, £552m in 1985-86. (TT, pg. 5)

February 23, 1983: "The official estimate for the cost of Trident is £7500m but there are many people who believe that the ultimate cost will be more than £9000m". (TT, pg. 6)

Defense news shock: The Falklands cost forecasts indicate that additional cost of the garrison will be extended beyond 1984-85. Therefore, add difference to 1984-85 and 1985-86. Safe to assume that it will continue beyond that for 1986-87 and 1987-88 at slightly less than the cost for 1985-86 - say, £450m.

1983Q1: PDV = $(684 - 250)/1.1 + (552 - 250)/1.1^2 + 450/1.1^3 + 450/1.1^4 = \text{\pounds}1289.6$ million

November 18, 1983: Britain will abandon target of achieving real growth of 3% a year in defense spending from 1986-87 onwards, as confirmed by MoD (Michael Heseltine), saying it would be irresponsible to argue for the target to be continued indefinitely. (TT, pg. 5)

This was already expected.

February 17, 1984: Public Expenditure WP released. Spending projections executed to match inflation. WP forecasts a cumulative increase in defense spending of approx. 19% over the next three years. For the first two, spending (excluding Falkland costs) rises by 3% above inflation (i.e. NATO commitment). (TT, pg. 5)

Therefore, Government aims for growth in defense spending in 1986-87 of 4% in cash terms, which is predicted to yield 1% increase in real spending power assuming that inflation will be around 3% for the year. This indicates that defense expenditure is reaching a plateau. Falklands costs added to 1986-87 at £450m. (TT, pg. 5)

Defense budget forecasts from WP

FY	1983-84	1984-85	1985-86	1986-87
Pre '65 DWP	15716	17031	18060	18660

March 14, 1984: Cost of Trident program increased to £8,729m due to exchange rate variations, as 45% of the program cost is in dollars. (TT, pg. 2)

Defense news shock: Falklands cost has already been accounted for, but 1% real increase in 1986-87 (i.e. \pounds 180m) is unexpected. Also, Trident program has increased in cost by \pounds 1,729m.

1984Q1: PDV = 180/1.107² + (1729/15)/0.107 [1 - 1/1.107¹⁵] = £989.7 million

May 14, 1984: MoD (Heseltine) releases second Defence WP. Britain to spend £17,000m in defence in FY 1984-85. Pledges to enhance and improve the capability and efficiency of the armed forces but recognizes that the resources which can be devoted to defense are not unlimited. (TT, pg. 1)

June 15, 1984: MPs estimate that Trident cost is at £9400m, nearly £700m above the latest estimate. (TT, pg. 2)

Defense news shock: Another increase in Trident of £700m

1984Q2: PDV = (700/15)/0.105 [1 - 1/1.105^15] = £345 million

July 2, 1984: Article calculates that defense spending may outstrip spending limits in the long-run. Defense budget set at £17,000m for 1984-85, and rises to £18,700m by 1986-87. After that, only negligible growth beyond inflation. Estimates put budget at £19,900 by 1988-89. However, article believes that administration is underestimating cost of inflation and additional factors such as ongoing defence programs (i.e. Trident missile system) which may require as much as £24,600m by 1988-89. (TT, pg. 2)

September 5, 1984: NATO Commander calls for increase in defense spending of 7% a year for the rest of the decade for allies to have a "reasonable prospect of frustrating a Soviet conventional attack". There is no prospect of this happening. (TT, pg. 6)

December 13, 1984: MoD (Nott) says that there are no prospects of real growth in defense spending after 1986. (TT, pg. 2)

January 23, 1985: "Defence costs are expected to peak this year and next, as the Nato commitment to an annual 3 per cent real increase comes to an end, with real cuts thereafter". (TT, pg. 1)

"The Government has decided to spread the rocketing costs of the Trident nuclear deterrent system, now estimated at more than £10 billion, over 20 years instead of the initial 15 years". (TT, pg. 1)

Defense news shock: Both end of 3% real rise and cuts have been accounted for. More than £10bn means about a further £1bn increase in cost.

1985Q1: PDV = (1000/20)/0.11 [1 - 1/1.11²0] = £398.2 million

February 14, 1985: Defense outturn for 1984-85 at £17,033 million. (TT, pg. 2)

March 11, 1985: Gorbachev comes to power in the USSR

August 1985: Gorbachev announces moratorium on nuclear testing. US does not join, and moratorium ends on February 5, 1987.

November 13, 1985: "It is virtually certain that Britain's defence programme will decline during the next three years after the figures released yesterday by the Treasury." figures show that MoD (Helestine) resisted attempts by Treasury to cut hundreds of millions of pounds from his budget for each of the next three years. Figures, however, make little allowance for inflation: in 1986-87, spending planned to increase by 2.5% to £18,520m but general rate of inflation will not decline to 3.75% until the end of next year, which means that there will be a real decline in defense. (TT, pg. 5)

December 7, 1985: "The cost of defending the Falklands is rapidly declining. From £684 million in 1984-85 it will be £300 million in 1987-88, including the cost of the airport. Those forces deployed in the Falklands (and they must be in training somewhere) are much more useful there than they would be waiting in Western Europe for a war which is not going to happen. No part of our defence budget is more cost-effective, and the budget would not be smaller if we stopped defending the Falklands" (TT, pg. 8)

Defense news shock: The Falklands cost for 1987-88 is £150m less than initially thought.

1985Q4: PDV = -150/1.103² = - £123.3 million

January 16, 1986: Real value of UK defense budget expected to fall by at last 5% in the next few years. Real value for 1986-87 according to Treasury assumption will fall by about £1.2 billion due to underestimation of inflation costs. Decline will be partially offset by falling costs for Falklands operation, which is forecast to fall from £552 million this year to £192 million in 1988-89. Thus real cuts will range from 5% to 7%. (TT, pg. 5)

February 26, 1986: MoD (George Younger) announces that there will be cuts in the £8.5 billion a year defence procurement spending program. (TT, pg. 1)

March 10, 1986: "The tri-service cost of maintaining the garrison at its present level is around £370m a year". (TT, pg. 13)

May 13, 1986: "It is not so much Britain as Nato which needs to review its priorities. Britain's defence spending is now higher in absolute terms that that of any other country in Nato outside the United States. Faced with an inevitable reduction of resources, the Government should call on the alliance to decide where its own future needs to lie. [...] But the indications are at present that Whitehall is in some difficulties over making up its own". (TT, pg. 13)

June 26, 1986: "The operational capability of Britain's armed forces is under threat because of large cuts in defence spending over the next three years, an all-party Commons report said yesterday. While the Ministry of Defence has attempted to cloud the full scale of cash cuts, the defence Select Committee says that those could total 7 per cent in real terms by 1988-89, excluding spending on the Falklands".

Also mentions that strain on defense budget likely to be exacerbated by pay increases to armed forces which this year cost ± 129 million more than planned, and the purchase of a Type-23 frigate, which will be ± 36 million above planned. (TT, pg. 2)

July 1, 1986: MoD (Younger) announces that after 6 years of real growth, the aim is for cuts in the budget of about 1.5% or £280 million for each of the next three years. (TT, pg. 1)

Defense cuts beyond 1986 were announced in 1982 and have already been accounted for.

July 13, 1986: MoD (Younger) is seeking an extra £500 million for next year in order to maintain level funding for armed forces and avoid potentially damaging cuts in weapon orders. (TT, pg. 1)

December 19, 1986: MoD (Younger) cancels project of RAF airborne early-warning (Nimrod). (TT, pg. 4)

January 15, 1987: Defense spending will be reduced by just under £1 billion in real terms in the next three years, from the estimates outturn of £18075m at the end of 1986-87 to planned expenditure of £17,720m by 1989-90. (TT, pg. 5)

January 28, 1987: Revised estimate of Trident program cost at £9265 million, which is a reduction of £546 million over the last estimate. (TT, pg. 4)

January 29, 1987: "Expenditure on the Falklands since the start of the war in 1982 totalled £2.6 billion by the end of the last financial year, Ministry of Defence officials told the defence select committee. The campaign itself including the cost of replacing equipment, $\cot \pounds 1.5$ billion; the subsequent $\cot \theta$ keeping garrison there stands at £1.1 billion. Of that £.1 billion, the building of the new Mount Pleasant airfield has cost so far just £200 million, but it will save £25 million a year in transport costs". (TT, pg. 4)

Defense news shock: Revised estimate of Trident program cost is about £1bn less than last forecast.

1987Q1: PDV = - (1000/20)/0.103 [1 - 1/1.103^20] = - £417.1 million

May 7, 1987: Defense budget for 1987-88 will be £18,782m. MoD (Younger) said UK will maintain all major defense roles despite the 5% real cuts. Budget will level out in 1989-90. (TT, pg. 1)

May 22, 1987: Discussion on whether to abandon Trident program. Total sunk cost by June will be about £2 billion, leaving approximately £7 billion in savings if cancelled and a further £4.6 billion from the operational cost of running Trident for 20 years. (TT, pg. 2)

June 4, 1987: Government goes ahead with Trident. Will cost £50m a month. (TT, pg. 2)

Defense news shock: cuts initially expected to be carried until mid 1990s, but recent article says that the budget will "level out" in 1989-90. Therefore, positive shock as 5 years of £350m cuts a year will not happen.

1987Q2: PDV = 350/0.09 [1 - 1/1.09^5] = £1361.4 million

Conservative Party wins general election on June 11, 1987. Margaret Thatcher remains as PM.

June 12, 1987: Reagan visits Berlin and gives "Tear down this wall" speech, challenging Gorbachev to tear down the Berlin Wall.

June 15, 1987: "The Government will face renewed pressure within Nato and from the chiefs of the armed forces to spend more on defence now that the voters have given an overwhelming mandate for strong security. [...] Nato's Supreme Allied Commander in Europe said he hoped that Mrs Margaret Thatcher would now decide to increase defence spending". (TT, pg. 2)

June 18, 1987: "Britain's infantry strength in the Falklands is to be reduced substantially next month [by 400 men]. The reduction is the first major cutback in infantry since the war to repel an Argentine invasion force ended five years this month. Plans for the island's defence are being scaled down. The cost of guarding the islands was £435 million in 1986-87 and is to be cut to £124 million in 1989-90". (TT, pg. 2)

September 14, 1987: MoD (Younger) is "expected to appeal direct to the Cabinet to approve the £6.5 billion funding for Britain's share of the European Fighter Aircraft (EFA) programme. [...] Defence ministers are due to meet in November to decide whether to go for full development". (TT, pg. 2)

September 22, 1987: MoD and Treasure are split on direction of defense spending. MoD wants to increase defense budget and Treasury, led by John Major, is adamant that it must continue to fall. (TT, pg. 22)

October 14, 1987: Margaret Thatcher seeks £700m cuts in Whitehall (i.e. ministries) administrative costs. MoD is prime target of Treasury for this, "which has singled out the Ministry of Defence as the worst culprit on wastefulness", with £5.1 billion of the £18.8 billion budget earmarked for running costs. (TT, pg. 1)

January 21, 1988: Defense budget is to rise from £18,850m this year to £19,208 million next year and £20,560 million in 1990-91. (TT, pg. 5)

May 17, 1988: LoD (Younger) to defend procurement policy as "best value for money" in upcoming WP. UK also decides to join EFA, which will cost up to £7 billion for 250 planes. (TT, pg. 5)

May 15, 1988: Soviet troops begin withdrawing from Afghanistan

Glasnost is also implemented by Gorbachev in 1988. Signals thaw of tensions in East-West relations. Articles also highlight the good relationship between Thatcher and Gorbachev. Thatcher famously said in 1984, when Gorbachev met with her in London before rising to power in 1985, that he was "someone we can do business with".

May 18, 1988: Defence WP reveals that on current inflation forecasts, defense budget will remain level in real terms between 1988-89 and 1990-91. (TT, pg. 1)

March 1, 1989: New plans for defense include increases of £175m in 1989-90, £610m in 1990-91 over previous forecasts. In 1991-92, provision will be £910m more than that of 1990-91. This means that the defense budget is set to grow by about £1 billion a year in cash terms over the next three years. (TT, pg. 12)

Defense budget forecasts (in 1989 prices)

FY	1989-90	1990-91	1991-92
May 1988	20134	20134	20134
March 1989	20134	21190	22100

Defence news shock: Government now plans to increase defense budget until 1991-92 by about 1% a year in real terms, as opposed to keeping it level. Projection is given in latest Public Expenditure White Paper.

1989Q1: PDV = (21190 - 20134)/1.103 + (22100 - 20134)/1.103² = £2573.4 million

November 16, 1989: Change in MoD: Tom King replaces George Younger. King keeps three-year plan for £1 billion a year rise. Forecast for budget is of £20.3 billion in current financial year, £21.2 billion in 1990-91, £22.3 billion in 1991-92 and £23.4 billion in 1992-93. (TT, pg. 4)

November 20, 1989: £1 billion annual increase is earmarked to replace fleet of Chieftain tanks. (TT, pg. 2)

December 11, 1989: MoD (King) warns that changes in Eastern Europe has created "more dangerous world", and uncertainty meant that now was not the time to consider cuts in defense spending. (TT, pg. 8)

January 29, 1990: Foreign Minister (Hurd) said Government has ruled out making premature cuts in defense spending. Statement "was clearly intended to quash reports that the MoD was also considering big reductions in its military commitments in response to the moves by the Warsaw Pact countries to transform their defence policies and to send home Soviet troops." (TT, pg. 9)

After fall of Berlin Wall and begin of the breakdown of the Soviet sphere of influence under the Warsaw Pact, many Western countries begin to restructure defense spending. US and West Germany announce defense cuts and scaleback in troops.

January 31, 1990: Regardless of diminishing threat from Warsaw Pact, defense spending to continue to rise by an average of 1% a year in real terms. Previous forecast remains. (TT, pg. 4)

February 12, 1990: Margaret Thatcher justifies decision to maintain increase in defense spending, saying that the Soviet bloc is not the only threat to British security, highlighting dangers in the Middle East. (TT, pg. 6)

March 23, 1990: MoD involved in intense debate over defense spending for upcoming WP. (TT, pg. 4)

April 3, 1990: Kremlin attacks British defense plans to maintain increase in defense spending, saying it is reminiscent of the Cold War. (TT, pg. 10)

May 10, 1990: "With Whitehall departments mobilizing for what is being hailed as the toughest public spending round since 1979, reports yesterday suggesting that Mr. John Major, the Chancellor of the Exchequer, was looking for a £1 billion slice out of next year's defence budget were seen as the first shot in a battle that will continue to the autumn". This would imply a cutback from £21.2 billion to £20.2 billion for 1990-91. (TT, pg. 2)

May 16, 1990: MoD orders a freeze in defense spending for six weeks, which is "a clear sign of the mounting pressures on the defence budget". (TT, pg. 2)

June 18, 1990: MoD (King) quells rumors of rifts within the Ministry over direction of defense budget. Defense review is underway in order to restructure defense forces following the developments in Eastern Europe and the Soviet Union. Alan Clark, Procurement minister of the MoD, rumored to have defended drastic cuts in force levels and promise of substantial savings. The Times reports that Clark does not favor early cuts in the defense budget, although he has indicated that there could be substantial savings "in the longer term". Generally accepted that present exercise it to restructure forces instead of seeking deep budget cuts. (TT, pg. 7)

June 20, 1990: MoD cancels order for 33 Tornado aircraft, which will save £530 million over five years. Announcements about delayed orders are expected over the next few months, according to ministry sources, as MoD is "nibbling at the edges" of the £21.2 billion budget. (TT, pg. 1)

Defense news shock: Cancellation of Tornado aircraft order

1990Q2: PDV = - (530/5)/0.123 [1 - 1/1.123^5] = - £379.3 million

July 17, 1990: MoD (King) dismisses prospect of drastic cuts in UK budget as a response to easing in tension of East-West relations and his defense review *Options for Change*. Margaret Thatcher sides with King "in not wanting immediate abandonment until a clearer picture emerges about political change, particularly in the Soviet Union". Premise of review is to reduce/restructure Armed Forces given the changed situation in Europe and the decline in tensions. (TT, pg. 4)

July 25, 1990: "In a report published yesterday by Safer World Foundation, an independent research unit, it was suggested that the defence budget could be cut by half in real terms by the end of the century. The report also said that many weapons projects could be cancelled, including the planned new tank to replace Chieftain, the European Fighter Aircraft, which is to replace the Phantom and Jaguar, and further orders of Type 23 frigates and attack submarines". Other studies argue that cuts are more around 20-25% in real terms if cancellation of equipment projects are not taken into consideration (i.e. defense budget cuts are in line with cut in forces). (TT, pg. 8)

Defense news shock: Assume defense budget is cut by 20% in real terms over the next ten years given the proposals in *Options for Change* given the restructuring of forces due to the end of the Cold War. Current defense budget at \pounds 22,280m, so 20-25% cut is of \pounds 5000m.

1990Q3: PDV = - (5000/10)/0.115 [1 - 1/1.115¹] = - £2883.9 million

UK joins US in Gulf War from August 1990 to February 1991.

September 12, 1990: Britain to send troops and tanks to Gulf. (TT, pg. 1)

October 4, 1990: Labour Conference votes on party defense policy. Voted on reducing defense budget to European average, which would mean a cut of more than £9 billion a year. This is an indication of the policy that a Labour administration may pursue if it wins the next general election in 1992. (TT, pg. 11)

October 12, 1990: UK prepared to foot \pounds 500m in spending for Gulf operations: "Provided the estimates of running costs remained stable, the total bill over the next six months would be about \pounds 500m. But in reality the figure will be much higher". (TT, pg. 13)

October 16, 1990: "The cost so far of Britain's Gulf Operations was estimated at £300 million. This is forecast to rise to more than £600 million by April". (TT, pg. 11)

October 31, 1990: Defense cuts announced in the summer on the cancellation of Tornado aircrafts will proceed regardless of Gulf War. MoD says Gulf War cost is expected to exceed £600m by the end of the year. (TT, pg. 8)

November 9, 1990: Another £235 million allocated for Gulf operations. Defense budget allocations announced reflect downturn in spending in next four years. Budget for 1991-92 will be £22.8 billion, which is nearly a 1% cut in real terms from 1990-91; budget for 1992-93 will be £23.35 million, a real cut of 2.2% (£230 million) from 1991-92; finally, real cut of 3.2% for 1993-94 budget. (TT, pg. 9)

Defense news shock: Gulf War. Estimates for the war cost range from $\pounds 2bn$ to $\pounds 10bn$ in the beginning of the war. I assume the average of this range - $\pounds 6bn$ over two years.

1990Q4: PDV = 3000/1.117 + 3000/1.117^2 = £5090.2 million

December 17, 1990: Conservative chairman in HoC opposes defense cuts. (TT, pg. 6)

February 6, 1991: Government will go ahead with plans for 8.7% reduction in defense spending in real terms over the next three years in spite of the Gulf War. Spending for 1990-91 is estimated to be £22.1 billion but ministers plan an extra estimate to provide for additional costs of forces in the Gulf, which is running at an estimated £4 million a day. (TT, pg. 8)

February 13, 1991: War in the Gulf may be less costly than previously thought. So far, has cost less than $\pounds 1$ billion; UK has received an unprecedented $\pounds 1.3$ billion in foreign contributions. In first week of Operation Desert Storm, estimates for war cost ranged from $\pounds 2bn$ to $\pounds 10bn$, but likely figure is likely to be much nearer the bottom of this range; article estimates $\pounds 1.5bn$. (TT, pg. 6)

Defense news shock: Gulf War less costly than previously thought. Estimate is around 2bn, so negative shock of £4bn over previous estimate.

1991Q1: PDV = - (4000/2)/0.108 [1 - 1/1.108^2] = - £3434.2 million

March 6, 1991: MoD to receive temporary boost from Treasury due to Operation Granby (British war effort in the Gulf), to save three armed services from having to make huge cuts next financial year to meet diminishing budget. *Options for Change* defense review put on hold for MoD to assess lessons learned from war with Iraq.

"The government, meanwhile, would have to abandon the idea of a 'peace dividend' for the foreseeable future. Extra Treasury money would be needed to prop up the defence budget, the sources said, and to help resupply the forces once they returned to Germany from the Gulf". (TT, pg. 2)

May 1, 1991: MoD (King) announces that defense spending will likely exceed estimates by $\pounds 1.5bn$, which confirms February estimate. (TT, pg. 7)

This is because of Gulf War.

June 20, 1991: MoD (King) says that defense spending will be cut back cautiously. Announces 20% cuts in the armed forces, but promises that there would not be a similar reduction in defense expenditure, as manpower cuts would be balanced by greater investment in equipment. (TT, pg. 2)

Assume 20% real cut for the next 10 years still stands. No positive shock as no spending announcement made.

July 9, 1991: Defence WP released, with Government pledging to maintain strong defenses to counterbalance instability in the Soviet Union and Eastern Europe. Defense budget will rise to £24,047m in FY 1991-92, which is £1157m above estimates to include Gulf War costs. Budget will then fall in real terms over the next two years, to £23,350m in 1992-93 and £23,280m in 1993-94. The three-year efficiency program is expected to show savings of over £2100m between 1988 and 1991. (TT, pg. 2)

This is fairly in line with the negative shock in 1990Q1.

July 10, 1991: "The defence budget is to be reduced in real terms by 6 per cent in the next three years compared with 10 per cent in the last five years, although spending on equipment will remain broadly level". (TT, pg. 1)

September 6, 1991: MoD says Government rules out further cuts in armed forces in spite of break-up of the Soviet Union. Article says 6% real reduction over four years, equivalent to £1.2 billion. (TT, pg. 5)

November 5, 1991: MoD will receive extra £500m to cover cost of implementing armed forces restructuring and pay for continuing Gulf War expenses. (TT, pg. 2)

Total spending for Gulf is still under £2bn and no further announcement of spending made, so no shock.

November 7, 1991: MoD will receive extra money in following years as well. £830m next year, £1.12bn in 1993-94, and £300m in 1994-95. (TT, pg. 9)

Defense news shock: This accounts for some extra spending on the Gulf War and program costs.

1991Q4: PDV = 830/1.095 + 1120/1.095² + 300/1.095³ = £1920.6 million

January 11, 1992: European Fighter Aircraft program likely to move forward. Will cost RAF £7 billion: "As one of the biggest defence projects, along with the Royal Navy's £10 billion Trident programme, EFA is likely to come under growing scrutiny." Article does not mention quantitative impact on future defense budget planning, but says the program "defies budget cuts". (TT, pg. 1)

March 24, 1992: Article reporting on a paper by the Oxford Research Group on past defense expenditure (see graph below): "With the end of the Cold War, rapid and successful adjustment of defence industries is now crucial for Britain's future economic health. Yet, so far, the adjustments have taken the form of lay-offs and closures, the report says. There are very few successful cases where companies have switched from military to civilian products. There is still a widespread belief within the defence industry that it is not possible to convert from military to civil production. Many companies seem to be fighting for the remaining orders rather than developing new civil opportunities". (TT, pg. 9)



Conservative Party wins General Election for fourth consecutive time. John Major replaces Margaret Thatcher as PM.

June 2, 1992: PM (John Major) seeks to keep German commitment to £21 billion EFA program after hint that it might withdraw. (TT, pg. 1)

October 1, 1992: "Cabinet ministers are likely to draw up battle lines today over a proposal that Britain should build the £22 billion European Fighter Aircraft on its own it its three partners pull out. [...] But Michael Portillo, chief secretary to the Treasury, is likely to resist. He is already keeping a close watch on

EFA costs and Treasury officials say that if the fighter aircraft is to be saved, reductions must be found elsewhere in the defence budget". (TT, pg. 1)

December 1, 1992: Commons defence committee says that Government should abandon deep cuts to defense budget planned under *Options for Change*. (TT, pg. 10)

February 4, 1993: Chancellor's Autumn Statement ordered for additional reduction of the defence budget by £1.05bn in 1993-94 and 1994-95. (TT, pg. 2)

July 3, 1993: Defence WP announces plan to go forward with £1.05bn cut forced upon the MoD by the CoE. Defense estimate for 1993-94 is £24bn. Article mentions that defense cuts are to draw opposal from Conservative backbenchers and that further spending cuts are expected in the fall. (TT, pg. 1)

October 18, 1993: Defense cuts of £1 billion a year proposed by CoE (Clark) for defense for the next three. MoD (Rifkind) stands in opposition. (TT, pg. 1)

November 6, 1993: CoE announces cuts planned over 10 years starting April 1, 1994 of a total of £5 billion. MoD (Rifkind) manages to reduce demands in Treasury cuts for defense in the next three years (initially £1bn a year) to £200m in 1994-95, £300m in 1995-96, £700m in 1996-97. However, package of cuts envisages longer-term reduction program of £500m a year for the seven years after 1996-97. (TT, pg. 2)

Defense news shock: This is in line with the budget cut assumed in 1990. However, it seems like the cuts will extend beyond 2000, and there will be cuts of £500m a year from 1999-00 to 2003-04.

1993Q4: PDV = - 500/0.066 [1 - 1/1.066^5] = - £2072.2 million

April 27, 1994: Defence WP released. Cuts in defense to meet Treasury demands are expected to be £750m a year from 1996-97 onwards. Cuts of £260m in 1994-95 and £520m in 1995-96. (TT, pg. 8)

Defense news shock: Cuts are larger than previously thought by £250m a year.

1994Q2: PDV = - 250/0.075 [1 - 1/1.075^5] = - £1011.5 million

Several articles for the rest of the year outlining departments that suffered cuts due to commitment to program. RAF suffers the majority of the hit to spending.

July 6, 1995: Michael Portillo, former chief secretary to the Treasury, will replace Malcolm Rifkind as MoD. (TT, pg. 4)

March 14, 1996: Margaret Thatcher calls on Western countries to boost defense spending: "Countries are cutting their defence expenditure too much. [...] I'm not critical of Britain, but looking at the dangers that we have now, we need to step up our defence expenditure". (TT, pg. 14)

May 2, 1996: RAF is to withdraw completely from Germany by 2002. Defense budget "will remain broadly level in real terms over the next three years": £21.4 billion in 1996-97, £21.9 billion in 1997-98, £22.6 billion in 1998-99. (TT, pg. 9)

Defense news shock: new review decides not to go forward with projected cuts for 1996-97 to 1998-99.

1996Q2: PDV = 750/0.075 [1 - 1/1.075^3] = £1950.4 million

June 10, 1996: Defense review by Labour Party conducted. An incoming Labour administration would "keep spending to the existing £21 billion a year and also promise to maintain the Trident nuclear submarine deterrent". (TT, pg. 9)

June 28, 1996: MoD announces cuts in Armed Forces through sale of married forces. Margaret Thatcher criticizes this and says that further cuts would be "very dangerous". (TT, pg. 2)

July 19, 1996: Cabinet agrees on spending ceiling of £268 billion for next financial year and "sources close to the Chancellor last night emphasised that the defence budget would not be protected, despite assurances by John Major". Therefore, further cuts in defense budget are expected. (TT, pg. 4)

November 6, 1996: "The defence budget appears largely to have escaped the Chancellor's knife, despite Treasury interest in slicing several hundred million off next year's £21.9 billion spending plans". (TT, pg. 10)

March 3, 1997: The Times discusses possible policy change in defense if Tony Blair, Labour Leader, is elected PM on May 1st: "At the broad policy level, it is risky for the Opposition to attack spending cuts which it says it has no intention on reversing. Since Mr. Blair contends that the Tory defence cuts have resulted in 'a damaging gap between commitments and resources', it follows that under a Labour government something would have to give". (TT, pg. 6)

March 5, 1997: "MPs on the Commons Defence Committee said there was a well-made case for reversing some of the cuts imposed under the Government's Options for Change review in 1990 and Frontline First in 1994. Understaffed units, particularly in the infantry, were suffering". (TT, pg. 5)

Labour Party wins General Election for the first time in 18 years on May 1st, 1997. Tony Blair becomes PM.

May 14, 1997: MoD (George Robertson) "indicated an intention to maintain spending at the present level, about £21.8 billion." Says he will produce a review of defense. (TT, pg. 2)

September 19, 1997: Review will not be completed until next January. MoD says that Government is not expecting to reap further cuts from review. (TT, pg. 9)

December 23, 1997: European defense ministers sign agreement for full production of Eurofighter project, which will cost a total of £40bn. UK share of £16bn. "Deliveries to the RAF are scheduled to begin in June 2002 and run until 2014". (TT, pg. 6)

Defense news shock: Eurofighter to cost £16bn over about 15 years.

1997Q4: PDV = $(16000/15)/0.0634 [1 - 1/1.0634^{15}] = \text{\pounds}10133.4 \text{ million}$
June 1, 1998: "A campaign by Treasury officials to cut the defence budget by up to £2 billion may provoke one of the fiercest Whitehall battles over spending. George Robertson, the Defence Secretary, has told the Treasury that he can save £500 million from his annual budget as a result of the Strategic Defence Review. [...] The MoD budget of about £22 billion [...] has suffered a series of heavy cuts during the past eight years". (TT, pg. 1)

July 2, 1998: Compromise reached between MoD and CoE for cuts of £915m in real terms in defense spending over next three years. (TT, pg. 1)

Defense news shock: cuts over the next three years to be about ± 305 m a year, and not ± 750 m as previously thought.

1998Q3: PDV = 445/0.0614 [1 - 1/1.0614^3] = £1186 million

March 3, 1999: "Mr. Robertson estimated that Operation Agricola, the codename for Britain's participation in the proposed Kosovo Force, would cost £125 million in the first six months". (TT, pg. 13)

Defense news shock: Cost of military operations in Kosovo

1999Q1: PDV = £125 million

April 23, 1999: "NATO countries are devising a multibillion-pound aid programme to preserve stability in the Balkans and encourage a democratic alternative to Slobodan Milosevic in Yugoslavia. German sources say that at least £3 billion will be needed for the next five years". Total cost for all countries is around 15bn£. (TT, pg. 15)

June 11, 1999: "Price of peacekeeping in Kosovo to the British taxpayer is likely to be up to £3.5bn over the course of five years, senior Whitehall sources acknowledged yesterday". (TT, pg. 3)

Defense news shock: Long-term cost of peacekeeping in Kosovo

1999Q2: (3500/5)/0.046 [1 - 1/1.046^5] = £3064.4 million

February 10, 2000: Treasury demand for 3% "efficiency saving" per year for four years on defense budget, amounting to annual cutback of £500m. HoC Committee says that "a year-on-year programme of efficiency savings can have a debilitating effect at all levels of command". MoD (Geoff Hoon) says that Committee report "unfortunately came too early to reflect the fact that the MoD's budget has just been increased by nearly £600m to take into account the costs of the Kosovo and Bosnia operations". (TT, pg. 1)

July 3, 2000: Armed Forces call for £300m increase in budget to cope with increasing commitments. (TT, pg. 1)

July 15, 2000: Agreement in Cabinet, after Forces plea, to bring defence budget up to £24bn. (TT, pg. 2)

Kosovo campaign in 1999 incurred extra costs on MoD of £325m. Forecast of extra spending for Kosovo in the future is of £220m in 2000-01, £130m for 2001-02, and £110m for 2002-03. (TT, pg. 1)

July 18, 2000: UK to offer aid of £10m to Sierra Leone from defense budget. (TT, pg. 1)

Defense news shock: Kosovo and Sierra Leone costs

2000Q3: PDV = 10 + 220 + 130/1.0562 + 110/1.0562^2 = £451.7 million

9/11 attacks in September 2001.

September 12, 2001: "Defence spending expected to rise in wake of terrorist attacks". (TT, pg. 1)

October 9, 2001: "Figures from the Ministry of Defence show that defence spending has dropped by 3.6 per cent in real terms from 1998-99 to 2001-02, to stand at a little less than £23 billion". Conservative MPs call for increase in defense spending. (TT, pg. 18)

November 26, 2001: Forces given £120m for war: "Gordon Brown (CoE) will announce tomorrow an emergency £120m allocation for the war on terrorism". "This figure is too big to reflect the foreseeable costs of Britain's participation in the war as it is being fought now. Alternatively, it is much too small if Britain were to engage in an extensive international peacekeeping operation along the lines of which Clare Short has dreamt". Article concludes that it is unclear what role Britain is to play in the operations in Afghanistan. (TT. pg. 1)

Defense news shock for 2001Q4: £120m for initial war on Iraq. Unclear if spending will rise in the future so just include the initial sum.

2001Q4: PDV = £120 million

December 19, 2001: US Defense Secretary (Donald Rumsfeld) says terrorists may strike London next and urges UK and allies to "much higher defence spending". (TT, pg. 1)

January 21, 2002: UK to provide £200m in aid to Afghanistan over 5 years. (TT, pg. 12)

February 15, 2002: MoD report says Armed Forces "are to be given a new mission to find and strike at terrorist organisations who pose a security threat to the United Kingdom [...] After the September 11 attacks Britain must now be ready and willing to deploy significant forces abroad". MoD officials say that financial implications for budget still being worked out. (TT, pg. 4)

March 20, 2002: MoD wants extra £1bn a year for three years "to buy key equipment for expeditionary warfare and to cope with the demands posed by the September 11 terrorist attacks". (TT, pg. 7)

Defense news shock: £200m over 5 years in aid for Afghanistan plus £1bn over three years due to war on terror.

2002Q1: PDV = (200/5)/0.05 [1 - 1/1.05^5] + (1000/3)/0.05 [1 - 1/1.05^3] = £1080.9 million

July 16, 2002: "Defence spending has been given its biggest boost for 20 years, with an extra £3.5bn over the next three years, a rise in real terms of 1.2 per cent on average each year. [...] The budget will rise from £29.3bn in 2002-03 to £32.78bn by 2005-06". (TT, pg. 10)

Defense news shock for 2002Q3: War on Terror increase in spending is actually £3.5bn over three years

2002Q3: PDV = (2500/3)/0.051 [1 - 1/1.051^3] = £2265.1 million

October 15, 2002: "The Ministry of Defence is to start to issue contracts for hundreds of weapon systems for a campaign against Iraq once the political decision has been taken to prepare for war. [...] Unlike the 1991 Gulf War, when Kuwait, Saudi Arabia, Germany and Japan helped to meet the cost, British taxpayers will have to pay for Britain's involvement in a second war against Iraq. The bill is likely to be at least £1 billion". (TT, pg. 18)

November 28, 2002: "Gordon Brown has set aside £1bn from Government reserves to help to pay for deploying British troops to fight a war in Iraq. [...] The total cost of the military action in Afghanistan so far has been about £620m to the end of September. [...] If there is a war in Iraq next year the US aims to end it quickly, within a few weeks. If it drags on, involving British troops in a longer campaign, costs would rise significantly." (TT, pg. 17)

Defense news shock: £1bn for Iraq. Expectation that allies will "end it quickly" so just £1bn for now.

2002Q4: PDV = £1000 million

February 10, 2003: Gordon Brown says that UK "will find the money to fight" and "did not dispute that a six-week war could cost £3.5 billion. (TT, pg. 14)

February 13, 2003: Gordon Brown adds £750m to the war budget for Iraq, which now stands at £1.75bn. (TT, pg. 1)

March 26, 2003: "A week into the war, and now we can see the bill. It seems certain that Gordon Brown will have to ask for more money in the Budget next month to pay for the war. On some estimates, he should ask for at least another couple of billion, on top of the $\pounds 1.7$ billion he has already put aside".

"Mark Stoker, defence economist at the International Institute of Strategic studies, reckons that the total bill for Britain could reach £4 billion, an increase of a sixth on this year's £25 billion defence budget". (TT, pg. 5)

budget, 2003	\$396bn
Extra cost of war to US] \$75bn
UK defence Judget, 2003	£24.6bn
Extra cost of E41	on
US war budget	Defence portion total: \$63bn
Total: \$75bn	Rebuilding of Iraq: \$7bn
	Transition period:
Assistance	\$12bn
\$8bn	Conflict:
<u> </u>	\$13bn
Homeland	Military
\$4bn	build-up:
	\$30bn
Cost per extra mont	h of conflict: \$7bn-\$9b
UK war budget	Personnel & support
Total: £4bn*	(inc communications,
Contingencies:	· · · · · · · · · · · · · · · · · · ·
	VH -
Equipment ——	
and munitions:	A Procurament
	Vial Part Housement.

March 28, 2003: "[...] President Bush and Tony Blair declared that they would wage war 'for however long it takes' to topple President Saddam Hussein. [...] Now both governments appear to be preparing for something much longer than the short, sharp conflict envisaged. [...] The Ministry of Defence is making contingency plans to send up to 6,000 more British soldiers [to Iraq] and Gordon Brown is almost doubling his war budget to £3 billion". (TT, pg. 1)

Defense news shock: Iraq was costlier than previously thought. Forecast now that it will cost £4bn.

2003Q1: PDV = £3000 million

April 10, 2003: "The apparent implosion of the Iraqi regime meant that the Chancellor was able to be more confident than he might have been that the £3 billion he had set aside would suffice to cover the costs of war. One the war and the ensuing peace, Gordon Brown seems to have got his numbers right". (TT, pg. 31)

October 31, 2003: Jack Straw, Foreign Secretary, says that British Government has spent £1.25 billion so far in Iraq and declines to say how much Britain's presence would cost in the future: "It is too early to predict the continuing costs of military deployment, support for the Coalition Provisional Authority and the development of bilateral relations beyond the end of this financial year". (TT, pg. 27)

November 4, 2003: Territorial Army, with a significant role in Iraq, may have to have pay cuts because MoD is suffering from unprecedented cash shortage, "seeking savings of hundreds of millions of pounds". (TT, pg. 4)

December 5, 2003: Gordon Brown tells MPs in HoC that costs of war on terror in Iraq and Afghanistan have soared to £5.5 billion (£2bn for Afghanistan; £3.5bn for Iraq): "Mr. Brown told the Commons that £250 million had been spent on reconstruction in Iraq with a further £300 million committed in addition to £3 billion, which he announced in the Budget that he was setting aside to fund military operations in Iraq. Spending so far on the war in Afghanistan, launched after the al-Qaeda terrorist attacks on the United States in 2001, and on the war on terrorism at home and abroad, was approaching £2 billion, he said". (TT, pg. 18)

December 8, 2003: Economic downturn leads to more austere planning to public spending. However, "Mr. Blair rejected speculation of defence cuts, as higher spending on health and education is protected. He admitted that there was a debate on how best to structure the Armed Forces, but said defence spending was planned to rise". (TT, pg. 2)

December 11, 2003: "In his speech yesterday, Mr Brown allocated an additional £500 million for dealing with Iraq and international terrorism in this financial year, and an extra £300 million for next year". This brings the total spent on Iraq and the War on Terror to £6.3 billion. (TT, pg. 34)

Defense news shock: War will take longer than expected. Operations will carry forward to 2004-05.

2003Q4: PDV = 500 + 300/1.038 = £789 million

So far, £4bn has been allocated to Iraq, and another £4.5bn allocated to Afghanistan and other operations regarding the War on Terror. With these extra allocations, total spending accounted for rises to £9.3bn.

FY	2003-04	2004-05	2005-06	2006-07
December 2003	500	300	-	-

Extra allocations for Iraq and Afghanistan

March 10, 2004: "Ministry of Defence officials are understood to have given a warning that up to 'a thousand cuts' in operational budgets will be needed next year to meet the £1.2 billion savings being asked by the Treasury. [...] Although the Chancellor allocated out of contingency reserves an additional £3 billion to the MoD for the Iraq war, defence chiefs believe that even this operation could be damaged by spending cuts". (TT, pg. 1)

Discussion of MoD cash shortage: "Why is it now a problem? Iraq, surely, is part of the answer. In theory, the war's costs have been covered by the £3 billion in special funds set aside by the Chancellor. But that sum has 'probably just about run out', according to Mark Stoker, a military finance analyst at the International Institute for Strategic Studies. He reckons that with about 11,000 troops in Iraq, the conflict is still costing about £80 million a month. Britain has also had about 10,000 troops in Northern Ireland, 3,000 in the Balkans and some 300 in Afghanistan. That is the legacy of Blair's willingness to send British forces into action". (TT, pg. 10)

April 26, 2004: "The British commitment to Iraq has been underpinned by a pledge from the Treasury to allocate £3 billion from contingency reserves, but, with planning underway to expand Britain's area of responsibility, the financial implications could be severe". (TT, pg.3)

July 2, 2004: Budget plans for MoD to be announced in two weeks likely to have budget cuts for all three Services. A report from the Commons Defence Select Committee warns government that this is "potentially dangerous and likely to inflict huge damage on Britain's ability to defend itself at home and carry out its military missions overseas". (TT, pg. 25)

July 13, 2004: CoE (Gordon Brown) announces that the defense budget will rise from £29.7 billion to £33.4 billion by 2007-08, a real terms increase of 1.4%. (TT, pg. 1)

July 22, 2004: MoD announces cuts in restructuring of Armed Forces of £2.8 billion over the next three years. (TT, pg. 1)

Defense news shock: Cuts are a budgetary concern regarding the increase in spending due to Iraq and Afghanistan, so I ignore it. Rise in £3.7bn in defense budget is resulting in deteriorated geopolitical scenario given war on terror.

2004Q3: PDV = (3700/3)/0.051 [1 - 1/1.051^3] = £3352.4 million

December 2, 2004: "British military operations in Iraq and Afghanistan have absorbed up to £4 billion, the bulk of it from Operation Telic, codename for the Iraqi campaign. Most of the new £520 million announced by the Chancellor yesterday is also expected to go into the 'Iraq war chest', Ministry of Defence officials said. [...] When the war started in Iraq last year, Gordon Brown announced that the Treasury was allotting £3 billion out of reserve funds to cover all the costs. With the continuing deployment of thousands of troops, however, and their likely stay in the country for another two years, the estimated costs have risen sharply." (TT, pg. 27)

"Mr Brown, who is unveiling his eight Pre-Budget Report as chancellor, will take the opportunity to raise additional cash from the Treasury's special reserve to fund peacekeeping in Iraq and Afghanistan, taking the total cost of the conflicts for the UK to almost £5bn". (FT, online)

December 3, 2004: CoE (Gordon Brown) also announces further £105 million for domestic counterterrorism security in addition to the extra Iraq funds. (TT, pg. 68)

FY	2003-04	2004-05	2005-06	2006-07
December 2003	500	300		
July 2004		300 + 520 + 150	400	400

Extra allocations for Iraq and Afghanistan

Defense news shock: £520 million announced by CoE to Iraq campaign plus £105 million for counterterrorism efforts. War will continue for at least two more years, so I assign £400m for 2005-06 and 2006-07.

2004Q4: PDV = (520 + 150) + 400/1.049 + 400/1.049^2 = £1414.8 million

March 17, 2005: CoE adds additional £400 million for special reserve fund for Iraq and Afghanistan operations in 2005-06: "The extra money from the Chancellor is further evidence that Britain's military commitments to Iraq and Afghanistan are expected to continue for the foreseeable future". (TT, pg. 9)

"Gordon Brown revealed that the combined cost of operations in Afghanistan and Iraq, as well as counter-terrorist operations, totalled £4.9bn last year, against an annual defence budget of £29.7bn. But the chancellor insisted the 'unanticipated cost' of the conflicts had not become unsustainable". (FT, online)

This is already accounted for.

September 21, 2005: "The financial cost to taxpayers of the war in Iraq was £3.1bn up to the end of March. Since then, Gordon Brown has provided another £400m in contingency funds, though this is earmarked for both Iraq and Afghanistan. He is expected to pledge more money in November's pre-Budget Report". (FT, online)

December 6, 2005: CoE (Brown) pledges more money for Iraq and Afghanistan campaigns in pre-Budget Report: "Gordon Brown announced an extra £580 million for the special reserve funds to help meet the costs of military operations, including Iraq". (TT, pg. 14)

"Mr. Brown said funding for the security and intelligence services [...] is to be increased by a further £85m to help finance an ongoing major recruitment drive for new officers, agents, and analysts. The Treasury is also making available an extra ring-fenced allocation of £50m, expected to be matched by similar funds from other government departments, to boost other areas of counter-terrorism and security planning, including policing and special equipment for other emergency services". (FT, online)

Defense news shock: £580 million for Iraq and Afghanistan plus £135 million in counter-terrorism intelligence.

2005Q4: PDV = 580 + 135 = £715 million

March 7, 2006: "Britain's intervention in Iraq has cost £4 billion, ministers have admitted. Operations by British troops in Iraq are expected to cost more than £1 billion this year alone and are rising by about £100 million a month. Gordon Brown has tended to avoid placing a figure on the cost of the Iraq war, preferring to talk instead about the war on terrorism, which includes operations in Afghanistan and security at home". (TT, pg. 4)

March 23, 2006: "The Government is hoping that conditions in Iraq will stabilise sufficiently to justify substantial troop withdrawals over the next 18 months. But the Chancellor's approval of another injection of funds from the special reserve for 2006-07 indicates that Iraq will be a significant drain on resources for the foreseeable future".

Article also mentions that now an increasing proportion of war funds will have to go towards the Afghan mission because of the planned deployment of 3,300 troops and therefore balancing the books for both operations is going to become increasingly difficult unless the military presence in Iraq is reduced. Finally, it provides an overview of the spending in Iraq up to now: "The financial burden [... is now well in excess of the Government's original estimate for the mission. [...] In 2002-03 the Government allocated

£848 million for Iraq from the special reserves. This increased to £1.3 billion in 2003-04, because it included the combat phase of the mission. In 2004-05 the cost was still high, at £810 million, and the estimate for 2005-06 is £1.3 billion, although this includes funding for the expanding operation in Afghanistan". (TT, pg. 2)

"The £800m allocation is lower than last year's £980m, but the MoD has shown a tendency to revise the figure upwards as the year progresses and new military needs are identified. For instance, the MoD recently returned to the Treasury to say it would need £1.3bn for the year just gone, rather than the £980m set aside originally. The MoD said the increase in spending last year was a one-off spike that was explained largely by the need to upgrade equipment for the thousands of troops about to get posted to Afghanistan [...] While it has not provided an estimate of probable future costs in Iraq, the MoD has said it will spend about £1bn in Afghanistan in the next five years". (FT, online)

Gordon Brown allocates \pounds 800m for Iraq in 2006-07. Since troop withdrawals are only expected in 18 months, extend \pounds 800m for 2007-08 and \pounds 600m to 2008-09. Also, include \pounds 1bn for Afghanistan over the next five years (\pounds 200m a year).

FY	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11
December 2003	500	300						
July 2004		300 + 520 + 150	400	400				
December 2005		970	400 + 580 + 135	400				
March 2006			1115	400 + 800+200	800 + 200	600 + 200	200	200

Extra allocations for Iraq and Afghanistan

Defense news shock: Additional costs for military operations in Iraq and Afghanistan, which are taking longer than expected.

2006Q1: PDV = 1000/1.042 + 1000/1.042^2 + 800/1.042^3 + 200/1.042^4 + 200/1.042^5 = £2920.3 million

July 5, 2006: "The hard-pressed British forces in Afghanistan were told by Tony Blair and Gordon Brown yesterday that they could have 'anything they need' to defeat the Taleban. The open-ended promise came after days of headlines about complaints from British generals over shortages of essential equipment." (TT, pg. 1)

September 4, 2006: "For if the fighting in Afghanistan is to continue at the current level, then the financial allocation that was initially made - £1 billion taken from the Treasury contingency reserve, not the defence budget, to be accounted for five years - will obviously be inadequate. It is perfectly possible that the threat posed by the Taleban will be reduced in a relatively short order, but it would be wise to increase the sum that can be spending by the military". (TT, pg. 19)

September 8, 2006: Tony Blair announces he will be stepping down as PM by September 2007. (TT, pg. 1)

Defense news shock: Another £1bn expected for Afghanistan over the next five years.

2006Q3: PDV = (1000/5)/0.049 [1 - 1/1.049^5] = £868.3 million

FY	2006-07	2007-08	2008-09	2009-10	2010-11
March 2006	1400	1000	800	200	200
Sept. 2006	1600	1200	1000	400	400

Extra allocations for Iraq and Afghanistan

January 13, 2007: "Tony Blair responded yesterday to growing pressure from military commanders by accepting that more money would have to be spent on Armed Forces to improve their conditions and equipment and to enable Britain to remain a war-fighting power. [...] Blair took soundings from military chiefs, politicians, academics and a few representatives from the media [...] there were suggestions among the specialists canvassed that the expenditure of 2.2 per cent of the country's gross domestic product on defence should rise to at least 4 per cent." (TT, pg. 4)

July 26, 2007: Construction of £4 billion aircraft carrier project approved by the MoD together with announcement of settlement of negotiations with Treasury as part of the Government's spending review, which will increase the defense budget by \pounds 7.7 billion over the next three years. This is a real term increase of 1.5%. The MoD (Des Browne) said that it represents a continuation of the "longest period of sustained real growth in planned defence spending since the 1980s".

August 26, 2007: Financial Times calculates that total spending on Iraq has reached £6.6bn - £5bn in military spending from the contingency reserves plus £1.6bn from government departments with no support from the reserves: £744m in aid and £680m debt write-off from the Department for International Development, and £170m from the Foreign Office to pay for private security companies to protect staff and offices. In addition, Afghanistan has spent £1.6bn of the contingency reserves up to now. (FT, online)

Defense news shock: £7.7bn over 3 years for the defense budget due to new equipment costs

2007Q3: PDV = (7700/3)/0.057 [1 - 1/1.057^3] = £6899 million

October 10, 2007: Another £400 million has been allocated by the Treasury for operations in Iraq and Afghanistan for next year. (TT, pg. 1)

Defense news shock: Additional £400 million for Iraq and Afghanistan in 2008-09

2007Q4: PDV = 400/1.051 = £380.6 million

Extra allocations for	Iraq and	Afghanistan
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FY	2006-07	2007-08	2008-09	2009-10	2010-11
March 2006	1400	1000	800	200	200
Sept. 2006	1600	1200	1000	400	400

Oct. 2007 - 1200	1400 400	400
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November 9, 2007: Retired military chiefs and Conservative MPs are joining forces to press Government for more spending on Armed Forces and overseas campaigns. While welcoming the recent real increase of 1.5% in the defense budget, they have argued that this is not enough as defense costs have increased by 8% and that defense spending as a proportion of GDP is still at a low 2.2 per cent. (TT, pg. 16)

February 8, 2008: Defense ministers meet and launch rearguard action to stop alliance rupturing over Afghanistan. Decision made that NATO mission in Afghanistan needs more troops in order to be successful. (TT, pg. 41)

February 23, 2008: Article on a report by Joseph Stiglitz and Linda Bilmes on aggregate costs of Iraq and Afghanistan wars to the UK. £9 billion has already been spent on Iraq alone, and does not include for "tail" in overall war costs of looking after disabled, replenishing equipments, etc. Based on model by authors, which assume that forces in Iraq are reduced to 2,500 this year and remain at that level until 2010, and that forces in Afghanistan increase from 7,000 to 8,000 in 2008 and remain stable for three years, the budgetary cost to the UK of the wars in Iraq and Afghanistan will total more than £18 billion by 2010, or £21 billion if social costs are included. (TT, pg. 21)

March 13, 2008: "Military operations in Iraq and Afghanistan next year (2008-09) will cost at least £2 billion, the Chancellor estimated. [...] Mr. Darling's arithmetic reflects that troop numbers in Iraq are expected to come down while the troop strength in Afghanistan is not expected to rise significantly". (TT, pg. 8)

Total value of operations in Iraq and Afghanistan accounted for up to now adds up to about £16bn. Stiglitz & Bilmes forecast therefore entails that costs of operations until 2010 will be over £18bn, so assume about £18.5bn which adds an additional £2.5bn to the estimates for 2009-08 and 2009-10.

FY	2006-07	2007-08	2008-09	2009-10	2010-11
March 2006	1400	1000	800	200	200
Sept. 2006	1600	1200	1000	400	400
Oct. 2007	-	1200	1400	400	400
Stiglitz & Bilmes	-	1200	1400 +1250	400 + 1250	400

Extra allocations for Iraq and Afghanistan

Defense news shock: Additional allocations according to Stiglitz & Bilmes forecasts until 2010 are in line with the cost forecast for Iraq and Afghanistan for 2008-09 (i.e. at least £2bn). Thus, shock of an extra £2.5bn over the next two years.

2008Q1: PDV = 1250/1.0446 + 1250/1.0446^2 = £2342.2 million

November 26, 2008: "The sharply rising costs of the war in Afghanistan were laid bare yesterday when the Ministry of Defence said that it would need more than $\pounds 2.3$ billion from Treasury reserves to pay for the campaign in Helmand province this year. The estimated cost for Iraq in the same period will be nearly $\pounds 1.4$ billion, despite the planned reduction in British troops in the south from present 4,100 to a few

hundred form May. The latest combined estimated bill of £3.7 billion for Iraq and Afghanistan means that the two operations will have cost the taxpayer £13.2 billion over the past six years". (TT, pg. 21)

December 12, 2008: "The Armed Forces yesterday became the first significant victims of government attempts to reduce spending in the face of the advancing recession. Two programmes worth £20 billion will be cut and delayed after defence chiefs were told that there was not enough money to go ahead as planned. The announcement throws into disarray the Army's £16 billion update to armoured vehicles, while the Royal Navy's £3.9 billion project for two new 65,000-tonne aircraft carriers is postponed by two years". (TT, pg. 2)

Ignore cuts motivated by recession/budget constraints.

December 16, 2008: "Yesterday it emerged that the Ministry of Defence expects its budget for Afghanistan to rise by more than 50 per cent next year from £1.51 billion in the financial year to £2.32 billion". (TT, pg. 3)

PM (Gordon Brown) agrees to spend £150 million for replacement vehicles (i.e. Warthogs) in Afghanistan over next two years. (TT, pg. 4)

December 18, 2008: PM (Gordon Brown) will announce today in HoC that Britain will end its military mission in Iraq by May 2009, six years after coalition forces invaded the country. Military campaign involving 100,000 British troops has cost the Exchequer £7 billion and 178 military personnel were killed. (TT, pg. 3)

FY	2006-07	2007-08	2008-09	2009-10	2010-11
March 2006	1400	1000	800	200	200
Sept. 2006	1600	1200	1000	400	400
Oct. 2007	-	1200	1400	400	400
Stiglitz & Bilmes	-	1200	1400 +1250	400 + 1250	400
Dec. 2008			3700	2320 + 75	400 + 75 + 2000

Extra allocations for Iraq and Afghanistan

Defense news shock: Assume no news for possible cuts in military as they are due to impending recession. Rise in costs for Afghanistan announced for 2008-09 and 2009-10. Gordon Brown announces withdrawal of British troops from Iraq in 2009, so assume no further costs beyond that. Contrastingly, there are no prospects of a withdrawal from Afghanistan, so I assume that the an amount similar to that estimated for 2009-10 extends to 2010-11 (I put it at £2bn).

2008Q4: PDV = (3700 - 2650) + (2395 - 1650)/1.0416 + (2475 - 400)/1.0416^2 = £3677.8 million

February 2, 2009: "Britain's deepening financial crisis has prompted the Treasury to pull back from funding any unexpected costs from fighting Iraq and Afghanistan, putting further pressure on the core defence equipment budget. Gordon Brown, as chancellor, set up the Treasury reserve to pay for any equipment urgently needed for operations and half of any unforeseen costs. But Treasury officials have recently told the Ministry of Defence to cover the entire cost of any overruns itself. The Treasury sees the move as increasing the incentive for the MoD accurately to estimate the costs of operations. [...] The

department agreed a budget of £635m for urgent operational requirements (UOR) in the financial year 2009-10 which would be met by the Treasury's reserve." (FT, online)

Defense news shock: Additional cost of Afghanistan in 2009-10.

2009Q1: PDV = 635/1.0242 = £620 million

April 30, 2009: "Gordon Brown yesterday rejected a call from British army chiefs for the government to increase permanently the number of UK troops deployed in Afghanistan, insisting that Britain is now shouldering its fair share of the burden in Nato's Afghan mission". (FT, online)

FT criticizes the decision in an editorial: "Britain's army also has the right to expect more from its political masters, who seem to believe they can do war on the cheap". (FT, online)

"Some Whitehall officials argue that the UK operation in Afghanistan is now well resourced, with the government spending more cash to improve army equipment. They note that the Afghanistan operation will cost a projected £3bn in 2009-10". (FT, online)

Additional cost accounted for in 2009Q1 through addition of £635m in UOR.

June 20, 2009: Threat of recession-driven 10 per cent cut in defense budget next year raised doubts about resources available for replacement of Trident nuclear deterrent. MoD will carry out review after General Election next year. Conservatives talk about 10 per cent cuts across Whitehall. (TT, pg. 2)

July 13, 2009: "Gordon Brown pledged to review troop numbers in Afghanistan after the presidential elections in an effort to head off army calls for a permanent increase in forces". (FT, online)

July 18, 2009: RAF will half its helicopter fleet over the next ten years to save £1.4 billion from the defense budget. (TT, pg. 11)

July 19, 2009: "The Treasury's plans assume cuts in defence spending in both nominal and real terms next year. In 2010-11, total defence spending is projected by the Treasury to fall by just over £2bn to £45.5bn". (FT, online)

September 16, 2009: "Three of Britain's biggest defence projects with a combined value of nearly £30 billion could be scrapped if the Conservatives win the general election next year". (TT, pg. 1)

September 22, 2009: "The British army is seeking to send 1,000-2,000 extra troops to Afghanistan in the next few months in an effort to bolster UK operations in Helmand province, according to senior military figures". (FT, online)

December 15, 2009: "Military spending will face a black hole of £36 billion over the next ten years if there is no increase in the defence budget, the National Audit Office warns today. As Bob Ainsworth, the Defence Secretary, prepares to announce cuts in manpower and equipment totalling £1.5 billion to try to keep with existing budget limits, the NAO says that Ministry of Defence procurement is bankrupt. Even if the defence budget rises by 2.7 per cent annually for the next decade, the shortfall will still be £6 billion, it says". (TT, pg. 3)

March 25, 2010: "Britain signalled yesterday that it expected the high tempo of military operations in Afghanistan to continue for the next 12 months, announcing plans to earmark £4bn for operational needs there in the 2010-11 financial year.

Alistair Darling said that, as usual, the money to be spent on operations in Afghanistan would come from the Treasury reserve and not the Ministry of Defence's core annual budget. The £4bn of projected expenditure in 2010-11 is little changed from the £4.2bn on estimated spending in Afghanistan this financial year

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According to MoD data, Britain's annual expenditure on the war is now more than double what it was in any year of the Iraq occupation from 2003 to 2009. The most the UK spent in any one year during that campaign was in the final year, 2008-09, when the figure was $\pounds 1.4$ bn.

In Afghanistan, annual military expenditure by the UK is now almost six times the figure it was when Britain first went into Helmand province in 2006 - partly because of a sharp rise in UK troops numbers to 10,000 but also because of the complexity of the military challenge in the country. UK annual expenditure in Afghanistan was £738m in 2006-07, £1.5bn in 2007-08, £2.6bn in 2008-09, and £4.2bn in the past financial year.". (FT, online)

Articles forecast that UK forces are expected to stay in Afghanistan at least for the next 3-4 years.

	1	U				
FY	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14
Stiglitz & Bilmes	1400 +1250	400 + 1250	400			
Dec. 2008	3700	2365	2475			
Feb 2009		3000	2475			
March 2010		4200	4000	4000	4000	4000

Extra allocations for Iraq and Afghanistan

Defense news shock: Afghanistan operations step up. Cost for current FY is £1.2bn higher than previously expected and budget for 2010-11 announced at £4bn. Since expectation is now to remain in Afghanistan for the next 3-4 years, extend £4bn budget to 2011-12, 2012-13, 2013-14.

$2010Q1: PDV = (4200 - 3000) + (4000 - 2475)/1.028 + 4000/1.028^2 + 4000/1.028^3 + 4000/1.028^4 =$ £13732.2 million

June 21, 2010: Government figures show that taxpayers have spent £20.34 billion on Iraq and Afghanistan wars between April 2001 and March 2010 - £18 billion in military operations on top of the defense budget, and the additional on aid and security for British officials. (TT, pg. 10)

This confirms Stiglitz forecast

October 21, 2010: Spending review is released and shows forecasts for special reserve funds for Afghanistan until 2014-15. Treasury forecasted over £15bn to be spent in Afghanistan: £4.1bn in 2010-11, £4.0bn in 2011-12, £3.8bn in 2012-13, £3.8bn in 2013-14, and £3.5bn in 2014-15. Cameron plans to withdraw in 2014-15, and the FT comments it is striking that there is such a high value put aside for that year even if the PM plans to withdraw. (FT, online)

FY	2010-11	2011-12	2012-13	2013-14	2014-15
March 2010	4000	4000	4000	4000	
Oct 2010	4100	4000	3800	3800	3500

MoD/Treasury forecasts for Afghanistan vs previous forecasts

Defense news shock: Since extension until 2013-14 was just a rough estimate, don't account for difference between the £3.8 projection and the previous £4bn forecast for 2012-13 and 2013-14. Shock here is additional £100m in cost for this FY plus extension of operations until 2014-15.

2010Q4: PDV = (4100 - 4000) + 3500/1.016^4 = £3384.7 million

March 22, 2011: "The cost of military action in Libya will be in the 'tens of millions', the chancellor has revealed, in an estimate that suggests planners do not expect the campaign to last more than about five weeks. [...] Military experts at the Royal United Services Institute put the cost of the intervention at about £2m-£3m a day. That suggests the MoD's working assumption is that the UK will prevail in Libya by the end of April. This assumption certainly jarred with the public statements of defence ministers, who said the length of the war was impossible to predict". (FT, online)

Defense news shock: Initial estimate of the cost of Libya operations are of $\pounds 2m$ - $\pounds 3m$ a day for five weeks: $(5*7)*2.5 = \pounds 62.5m$

2011Q1: PDV = £62.5 million

March 21, 2012: "George Osborne has for the first time spelt out the financial savings Britain will make by withdrawing its forces from Afghanistan over the next three years, announcing in the Budget that the UK will cut some £2.4bn from projected costs on the mission between now and 2015.

When he unveiled the four-year comprehensive spending review in 2010, the chancellor projected significant spending on Afghanistan operations from the Treasury's Special Reserve. Initial projections were for the UK to spend £3.8bn on the Afghanistan operation in 2012-13, £3.8bn in 2013-14 and £3.5bn in 2014-15, when the UK plans to withdraw fully.

In the Budget, Mr. Osborne has now revised those annual figures down significantly. The Treasury now plans to spend £3.7bn on Afghan operations in 2012-13, £3bn in 2013-14 and £2bn in 2014-15". (FT, online)

MoD/Treasury forecasts

FY	2010-11	2011-12	2012-13	2013-14	2014-15
October 2010	4100	4000	3800	3800	3500
March 2012			3700	3000	2000

Defense news shock: negative shocks of -£100m in 2012-13, -£800m in 2013-14, and -£1500m in 2014-15 due to improvement in scenario in Afghanistan.

2012Q1: PDV = (-100)/1.011 + (-800)/(1.011^2) + (-1500)/(1.011^3) = - £2333.17 million

December 5, 2012: "The Ministry of Defence may fall short of at least £2bn in its plans to overhaul Britain's armed forces by 2020 as a result of George Osborne's Autumn Statement, according to analysis of its budget. In a development that will be viewed with dismay by service chiefs, who have suffered years of cuts, defence analysts say the chancellor's plans to reduce the MoD resource budget by 2 per cent in 2014-15 could have severe consequences for the armed forces". (FT, online)

December 7, 2012: "Philip Hammond, defence secretary, has a fight on his hands in next year's Comprehensive Spending Review. The Ministry of Defence fears that the 2 per cent cut in its 2014-15 budget announced by George Osborne this week creates a new and lower spending baseline for subsequent years. This means it will have £500m a year less than current plans. As a result, it may be unable to fully finance its planned modernisation of the armed services by the end of this decade". (FT, online)

January 27, 2013: FT has an editorial about the contradiction in British defense policy between "its desire to be an assertive military player and its declining defence spending": "The government must now resolve this problem. In the next few months, George Osborne, the chancellor, will unveil a spending review. Mr Osborne must either halt planned new cuts in defence spending – and if possible reverse them – or he must be honest with the public about Britain's role and accept that the ritual instinct to take the lead in political-military interventions cannot be maintained". (FT, online)

February 26, 2013: "In the most detailed independent analysis to date this year on the state of the MoD finances, the Royal United Services Institute said on Wednesday that last year's Autumn Statement implied there could be a £1.1bn reduction in the 2015-16 defence budget. The report, by Professor Malcolm Chalmers, therefore argues that 'on reasonable assumptions, the MoD may need to find [about] £11bn in savings over the next decade'". (FT, online)

March 20, 2013: "Britain's decision to implement faster than expected drawdown of troops from Afghanistan this year has allowed George Osborne to save £300m on the cost of military operations inside the country in 2013-14, the Treasury announced on Wednesday. [...] The swift drawdown of British troops means that, according to new data published in the Budget, Mr. Osborne can now but back significantly on the amount he is spending on Afghanistan from the Treasury's Special Reserve next year, from £3bn to £2.7bn". (FT, online)

Defense news shock: £300m less than planned for Afghanistan in 2013-14.

2013Q1: PDV = - £300 million

December 5, 2013: In Autumn Statement, Osborne says the special reserve can be reduced by a further £900m in 2013-14 while still funding all operational costs due to the expedited process of troop withdrawals in Afghanistan. (FT, online)

Defense news shock: 900m less for Afghanistan..

2013Q4: PDV = - £900 million

June 19, 2014: "The head of the Nato alliance has stressed to David Cameron the importance of Nato members not falling behind their targets on defence spending, days after the Financial Times revealed that current plans would see the UK miss the threshold (i.e. 2% of GDP) in the next parliament". (FT, online)

July 14, 2014: "David Cameron is to announce on Monday that the government will invest an additional £800m in boosting the military's surveillance, intelligence and special forces and £300m on extending existing capabilities. The government said the £1.1bn was not new funding but a redeployment of underspending in the ministry of defence as a result of 'prudent budget management'". (FT, online)

Defense news shock: £1.1bn boost to defense spending in 2014-15

2014Q3: PDV = £1100 million

August 18, 2014: "Cameron's shifting policy on Iraq: In his four years as prime minister, David Cameron has been quick to urge Britain to take a stand when international crises flare up. As Muammer Gaddafi's Libyan regime threatened the people of Benghazi in 2011, the prime minister led calls for a humanitarian intervention to prevent a massacre. When jihadis killed 40 oil workers at a gas facility in Algeria last year, he warned of the 'large and existential threat' that faces the west. Now, as the Islamic State of Iraq and the Levant, known as Isis, spreads mayhem across Iraq, Mr Cameron is talking up the need for a vigorous UK response. Britain, he said yesterday, will 'use all the assets that we have', including 'military prowess' to defeat the 'monstrous' militant group". (FT, online)

December 4, 2014: In Autumn Statement, Osborne again says that special reserve will be lower than previous forecast for 2014-15 by £200m. (FT, online)

Defense news shock: Negative shock of £200m for Afghanistan

2014Q4: PDV = - £200 million

March 19, 2015: "The UK defence budget is facing a potential £5bn black hole because the government has underestimated the cost of buying weapons, MPs have warned". (FT, online)

June 1, 2015: "That the Ministry of Defence should find itself in the line of Treasury fire is no surprise. After the traumas of Iraq and Afghanistan, the British public is wary of military adventures. While George Osborne, the chancellor, is protecting health and education from future austerity, defence — the next largest department — is not so lucky. Last week, each unprotected ministry was ordered by the Treasury to try to slice a further 5 per cent — \pounds 1.4bn in the MoD's case — from its budget in this financial year. While the Conservatives say they will protect military personnel and equipment over the next five years, forthcoming reviews of overall public spending and defence are likely to make further reductions". (FT, online)

Defense news shock: while this is partly due to austerity measures, the defense budget is being reduced due to lack of military intervention prospects and public opposition to "military adventures".

2015Q2: PDV = - £1400 million

November 15, 2015: "David Cameron announced on Monday night £2bn of extra military spending aimed at tackling Isis, with investment in special forces, drones and fighter aircraft able to carry out ground attacks". (FT, online)

November 22, 2015: "Mr. Cameron will set out a five-year defence review with a focus on tackling Isis, including a 30 per cent increase in the counter-terrorism budget, £2bn on special forces and a new emphasis on cyber defences. A £12bn increase in the budget for defence kit over the next decade will take total spending to £178bn and will include funding for nine Boeing maritime surveillance aircraft to take on a potential Russian submarine threat". (FT, online)

Defense news shock: Reboot in defense spending plus ISIS threat in 2015 Spending Review

 $2015Q4: PDV = 2000 + (12000/10)*(1/0.012)*[1-(1/1.012)^{10}] = 2000 + 11244.58 = \text{\pounds}13244.6 \text{ million}$

May 30, 2016: "Defence spending by Europe's Nato states is set to rise for the first time in nearly a decade, figures show, as fears over Russian aggression and the migrant crisis in the Mediterranean stoke anxiety over security across the continent. But Nato secretary-general Jens Stoltenberg warned, in an interview with the Financial Times, that a UK vote to leave the EY could throw the turnround into jeopardy". (FT, online)

June 2, 2016: "A Brexit vote would be the biggest security and defence shock for the UK since the end of the empire and the withdrawal of forces east of Suez, the country's leading military think-tank has warned. In a research paper published on Friday, the Royal United Services Institute (Rusi) said a vote to leave the EU would require a fundamental rethink of Britain's international priorities - and could entail deep cuts to defence spending if short-term economic volatility reduced gross domestic product. [...] If voters choose to leave the EU in the June 23 referendum, the government would have to hold an urgent Strategic Defence and Security Review, Rusi said. Under current plans, the next is not due until 2020. While economic forecasts suggest defence and diplomatic spending would be hit by shrinking GDP, the paper also argues that Brexit could make Britain's military and diplomatic clout more important for national prosperity". (FT, online)

September 16, 2016: "Britain's armed forces cannot defend the UK against a serious military attack and have lost much of their ability to fight conventional wars, the recently retired head of the country's Joint Forces Command has warned. General Sir Richard Barrons, who stepped down in April as one of the country's four service chiefs, has said a series of 'profoundly difficult' strategic challenges are being sidestepped as Whitehall focuses on 'skinning' budgets and delivering costly but increasingly redundant big-ticket military projects". (FT, online)

September 19, 2016: Report by General Sir Richard Barrons has been met by apathy by politicians: "...response from politicians of all persuasions to the most powerful intervention yet from within the armed forces has been deafening silence". (FT, online)

December 23, 2016: "More than four decades after a sweeping military withdrawal from bases 'east of Suez', Britain is scaling up its defence engagement in the Gulf and Asia in what analysts regard as a recognition of the region's growing global importance. Britain is reopening a naval support facility in Bahrain, creating a permanent army presence in Oman and establishing new defence staff centres in Dubai and Singapore". (FT, online)

December 26, 2016: Editorial in the Financial Times argues that the UK must boost its defense role after Brexit, after years of apathy in its foreign policy role and letting Russia exert regional influence in the Middle East. (FT, online)

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