

Still Agile? – Back to the Future with Agile Forces

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Introduction

Anticipating future conflict is a popular activity, with the location and nature of future conflict being an important consideration in setting policy. Most such prognostication relies upon an estimate of what might be plausible.

Unfortunately events tend not to turn out as anticipated and visions of the future 20 years out often have to be totally updated within 5 years or so. This paper will examine how a more scientific approach has fared over the five years or so since its presentation at XXVI ISMOR.

The original paper (Ref 1) applied methods from complex systems to characterise the location of future conflicts in a potential future conflict space where the dimensions of conflict were based upon the Defence Concepts and Doctrine Centre's five dimensions of the future - Military, Resource, Political, Social and Technology.

Analysis of the data indicated considerable uncertainty in the conflict space, with transitions being close to random. Despite this, some trends existed within the data, and some surprising constants, which allowed useful advice to be given. This new paper will examine the conclusions of this research and the extent to which the analysis has been borne out by subsequent events.

The Study

The original study was carried out by the author together with a team from Dstl and is fully described in Refs 1-3, but the central concept of the study was to plot the location of conflicts in a 5-dimensional conflict space. These 5 dimensions were based upon those then used in the DCDC Futures work (Ref 2). The dimensions were adapted in some cases to make them both quantifiable and relevant to the study.

Dimension	Measure
Military	Manpower Force Ratio
Resource	Military Killed per Million Population
Political	Number of Participants
Social	GDP per Capita of the conflict zone ¹
Technology	Average Age of Equipment or their ratio

Table 1: Measures of the Dimensions

In some cases there were several different versions of these measures – thus the Resource measure – expressed as military killed per million population –

¹ At Purchasing Power Parity (PPP)

could be calculated for each of the participants in a conflict. Thus, for the Vietnam War, the level of KIA/Million for the US was around 280; the level for the Vietnamese was much higher, at around 27,500(!). Similarly the political measure could be calculated as the total number of participants, or separated out into separate Red and Blue measures.

The technology measure was based upon the age of the equipment of the participants. A total of five pieces of equipment were selected for each of the combatants and various measures were used – the average age of the equipment and the ratio of the ages. This was probably the most contentious measure, since there was no obvious way to objectively select the five pieces of equipment. An independent assessment of the same conflict using ten pieces of equipment for each side gave very similar overall results however.

One other important point was the definition of what was a conflict. Because the resource dimension used KIA/Million as part of its definition it was decided that only conflicts in which military personnel were killed would be counted as conflicts. In earlier periods this worked well to avoid counting less significant deployments of troops – as observers or military attachés for example – but in the more modern period where conflicts often only counted because of a single loss there was a danger of failing to count conflicts that were significant but did not count using the criterion.

The initial study concentrated on the US, France and the UK with conflicts that began after 1939. Since the presence of WW2 at the start of the sample had the potential to distort some of the results most of the significant results where this was a factor were also checked on a post-1945 dataset. The last conflicts included in the original analysis were the Israeli incursion into Lebanon in 2006. The dataset was extended in the second year of analysis to look at other countries, including Australia, New Zealand, Canada and an assortment of European countries. Data on the number of casualties for conflicts only continued to the end of 2008.

Structure of the Paper

The paper will address three different aspects of the results of the original study, to examine how they have endured in the 5 years since the original work was carried out. In any study advice is given at different levels of confidence and specificity. Sometimes the most useful lessons to be learnt from a study are the most general. This review will therefore consider three different levels of conclusions from the original study, which we will refer to as Themes, Trends and Predictions.

Themes

“Events, dear boy, events” – Harold Macmillan (when asked what was the most difficult part of the job of Prime Minister)

The most important themes that came out of the original analysis were both in some ways negative ones. The most obvious theme of the analysis was the way in which randomness seemed to dominate the experience of conflict over the past 60 years.

There was no obvious sequence of different types of conflict and movement in the conflict space was, as far as we could test, a random walk. The arrival rate of conflicts corresponded closely to a Poisson process and the duration of conflicts was exponentially distributed.

One useful formal test of randomness was to examine the ratio of values of the military dimension in successive conflicts. Since, in the null hypothesis, the value of the military dimension is a value sampled from a lognormal distribution, we would expect the ratio of successive values of the military dimension to also be distributed as a lognormal distribution, with a total variance equal to double that of the base distribution. This, within 3%, was what was found.

The second theme of the analysis was the comparative powerlessness of policy in the face of events. Several potential signals of policy effectiveness were explored to see whether they might modify the type and number of conflicts in which nations became involved. The distribution of the proportion of conflicts in which nations were involved on a decade by decade basis was compared with the known distribution of proportions drawn from statistical theory and almost exactly matched the theoretical model for random sampling.

When we looked at the affect of policy on the nature of conflict we found that the distribution of conflicts for ‘peacekeeping’ nations was on the margin of statistical separation from those of other nations ($p=0.075$) and the number of conflicts nations were involved in was strongly driven by the Real Total GDP of the country – either in absolute terms or relative to World GDP. The only unambiguously effective policy change was the constitutional prohibition on participation in conflict adopted by Germany and Japan throughout much of the post war period. This did succeed in dramatically reducing their involvement in conflict relative to other nations but obviously had significant foreign policy consequences.

Thus, in many ways the key lesson of the study was the sheer randomness of conflict, with involvement in conflict being driven by the extent of a nation’s interests and capabilities much more than its policy. The experience of conflict seemed to be very similar to pulling a ball from a bag, with the severity and nature of the conflict simply depending on which ball was drawn forth.

This idea seems unpalatable to a world in which we set policy and derive force structures from what we aspire to do. Unfortunately in real life it is not always apparent what it is that we are getting ourselves into. The operations in Iraq and Afghanistan are classic examples of this – it was not that long ago that Afghanistan was considered the ‘winnable’ conflict of the two.

Discretion is a curious thing – in the final analysis we can always avoid conflicts by being willing to give up what it is at stake but at the same time no Prime Minister or President of a western country would go to war unless they personally felt that there was no alternative.

So, how has this view of the world stood up over the past 5 years or so? There has been very significant change in the international situation – the Arab Spring has fundamentally altered the political situation throughout the Middle East and triggered conflict throughout the region. The NATO intervention in the conflict in Libya was a direct consequence of the Arab Spring which in turn has led to instability throughout North Africa, which in turn has led to the French intervention in Mali. The situation in Syria remains unclear at the time of writing, with the on-going civil war beginning to turn in favour of the government and its allies, with some hints the conflict may be about to spread into Lebanon and with western nations remaining very reluctant to intervene militarily.

The Arab Spring and its consequences do fit the model that we have proposed, with intervention being driven by events, interests and capability. The NATO intervention in Libya was neither anticipated nor desired, with the UK and US in particular being unwilling to accept new entanglements after the long struggles in Iraq and Afghanistan. The fact that the US had to provide a number of capabilities to support the NATO intervention despite these reservations show that policy is not always able to avoid involvement in conflict. Similarly the need for French intervention in Mali arose with little warning and was driven by events, interests and capabilities.

At the time of writing the UK, France and the US continue to resist direct military involvement in Syria. The insistence on a UN resolution and the reluctance of Russia in particular to condone such a resolution has thus far prevented involvement, though recent moves to lift the EU arms embargo show that direct military involvement continues to move closer.

Syria is a clear case of policy resisting involvement in a conflict, though the difficulty of doing this is also clear – the press of events, the sheer ferocity of the conflict, the danger of the Syrian chemical arsenal falling into the wrong hands and the potential destabilising consequences of the Syrian civil war to the region all press decision-makers towards intervention.

Other events in the world have also underlined the rapidity with which the international situation can change and with which the unthinkable can rapidly become all too likely. The death of Kim Jong-Il and the recent somewhat hysterical confrontation with Kim Jong-Un has underlined the risk to that region of the catastrophic collapse of North Korea. Recent spats between the

Chinese and their neighbours over various island chains also fall into categories that could quickly flare up into a crisis. The US pivot towards Asia has changed the calculation that the US would always be the lead nation in major interventions in the Middle East. Plus, of course, the continuing effects of the financial crisis, which have been both deep and more long lasting than were anticipated five years ago.

Thus in general, the overall themes of the original study have held up fairly well over the past 5 years. Events continue to surprise us and conflicts arise as a consequence of those events, usually with little warning and often in surprising places.

Trends

“I believe we are on an irreversible trend toward more freedom and democracy - but that could change.” – Dan Quayle

Although there were many signs of randomness in the sequence of conflicts there were also some observable trends. No trend was observable in the military or social dimension, but the resource, technology and political dimensions all showed statistically significant trends over the period of analysis, with the most important of these trends probably being the trend in resource, which was really quite rapid, at around 5-8% per year, depending on the precise measure that is used. This was an important trend since the size of the force deployed relative to population was also correlated with the resource measure – thus the implication was that smaller forces would be required over time. This was also important when calculating the likelihood of very severe events – the World War scale events. The evidence was that the intensity of conflict was distributed log-normally, but with power law tails above a certain level of intensity (around 10 KIA/Million population). If the mean of the intensity was changing, then the implication was that the likelihood of ending up in the power law tail was also reducing. The trend in the resource dimension was sufficiently strong that the effect on this probability was quite substantial. To check the trend we also carried out an analysis on a slightly longer timeline – with a partial sample of UK, US and French conflicts going back to 1760. This showed that the trend was actually very long established, with the number killed relative to population dropping steadily over the period, though at a slower rate prior to 1945.

Since this analysis not only do we have a few new data points, but also some other data points have now moved in the space. This is because we did not only consider conflicts that had ended. Since carrying out the analysis, losses in Afghanistan in particular have continued to rise and this may well have an effect on either the slope or confidence of the regression line. Since 2008 the US level of casualties in Afghanistan for example has risen from around 2 KIA per million population to 7.5 per million.

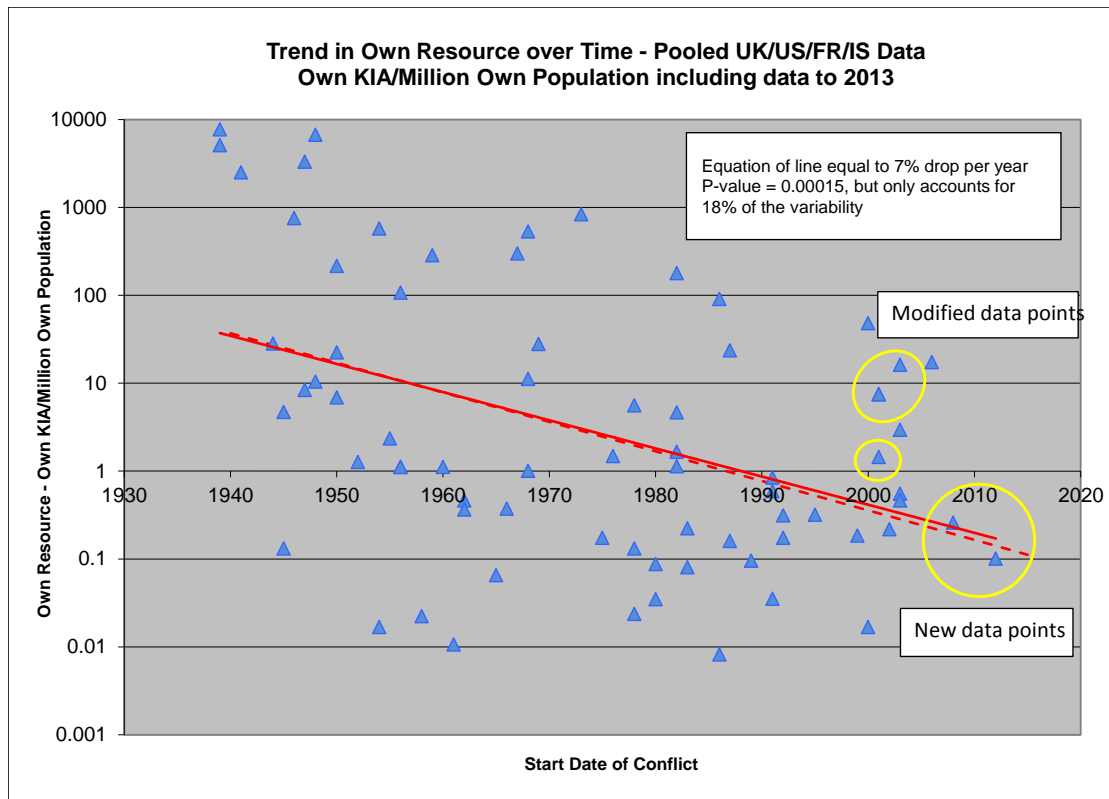


Figure 1 – Trend in Resource Dimension (Own KIA/Million Own Population)

Figure 1 shows the new data (circled) together with the modified data points (in the ellipse). The effect on the regression line is shown with the dotted line giving the previous regression line. As can be seen from this data, the two regression lines are almost identical, though with 71 points in the original data set, we have 68 original points and only 5 new or modified points, so this is largely to be expected. Both new data points lie close to the line, though of course the modified points have all moved further away from it.

Thus, although recent US, UK and FR experiences are of higher intensity conflicts (as measured by casualties), the long-term trend remains a strongly downward one. This is true even if WW2 is omitted.

That we might think otherwise is mostly because, prior to Iraq and Afghanistan, we had allowed a recent experience of a few low cost conflicts to convince us that war had become an exercise in the distant wielding of technological superiority. The Gulf War in particular was very influential in this, but on the longer-term trend it can be seen as lying well below the regression line.

Despite this, the issue of low-level casualties is increasingly an issue for the method, as can be seen by the points clustering around the 0.01/0.1 boundary. This is because we cannot have less than one KIA for a conflict to count, and thus 1/60 is the minimum that the UK can register for a conflict. This limit will set a bound for the resource dimension at the lower end and is likely both to understate the trend somewhat and to increase the proportion of significant conflicts where no-one on the UK or allied side is killed. The

importance of this can be seen from the Libyan conflict in 2011 where NATO committed significant forces without suffering any losses. This implies that if the method is to be useful in the future it will need to address the issue of what counts as a conflict in a more satisfactory way. It is likely that there will be a spectrum of all kinds of different kinds of deployment, from single soldiers up to thousands. Part of the nature of power laws is to set some kind of lower bound for the function. It may simply be better to do this in terms of scale of deployed force rather than resulting losses.

Some other support for diminishing casualty levels in conflict can be found in a book recently published by Steven Pinker (Ref 4) on indicators of violence in society. This book brings together a huge variety of evidence on murder rates, deaths in conflict and other measures to show that there has been a very long-term downward trend in violence relative to population, starting in at least the 17th century, with some evidence that the trend goes a very long way back. Hunter-gatherer societies have astonishingly high rates of death by violence, due to high levels of raiding and continual low-level warfare between tribes. Interestingly, the book also points out that evidence for randomness in conflict, such as Poisson distributions for the start of conflicts, had also been independently identified by Lewis Fry Richardson (Ref 5) in his work on 'Deadly Quarrels' in the 1920s.

The other dimensions for which trends were observed are unlikely to be affected by only a couple of extra data points, so we will have to await a further update in five years time to see whether the trend in the political and technology dimensions has continued.

The hypothesis was that the trend in the political dimension was driven by the accession of new members to the United Nations – there were simply many more countries that could send troops to a conflict in 2000 than there were in 1945. This has now flattened off, so it will be interesting to see whether the political axis does the same, or whether more fundamental processes drive the trend to more multi-lateral conflict.

It will also be interesting to see whether the steady trend to a greater technology advantage over the enemy is maintained as the pressure on Western economies from the financial crisis and the continuing growth of the developing countries continues. The full scale of the financial crisis was not yet plain at the time the original analysis was carried out, and one lesson of the study was the profound effect of economics on conflict so we might also expect an effect here depending upon how the economies of the Western world and their defence budgets are affected.

Predictions

"It is exceedingly difficult to make predictions, particularly about the future" – Niels Bohr

The most difficult and dangerous part of any study is forecasting. This final section will discuss two areas in which the original study attempted to make predictions about the future. As already discussed, the overall lesson of the study was that movement in the conflict space was largely random, even where trends existed they only accounted for 10-20% of the variability in the sample, not nearly enough to make anything other than quite general and statistical forecasts.

One area that showed some curious stability however, the 'dog that didn't bark', was the social axis. This was measured in the real GDP per capita of the conflict zone. Between 1945 and 2008 this measure of US, French, UK and Israeli conflicts showed no trend at all. This is surprising in that, over the period, real GDP per capita worldwide increased by a factor of about 3 times. In the early period, the countries in which intervention occurs tend to be richer than the average for non-European countries, by the later period they are more towards the lower end of the distribution.

Why exactly this happens is not entirely clear. One possibility is that this represents countries important and rich enough to warrant intervention but which are not so developed as to be able to sort out their problems through negotiation and discussion.

A second possibility is that this is related to demographics. There is a strong relationship between fertility rates (as measured in the number of live births per female) and GDP per capita. The fertility rate falls from a rate of around 8 to around 2 – the replacement rate – over almost exactly the range observed for the social dimension.

In either case, this does open up the possibility of estimating where future conflicts occur. If the range of countries in which intervention is likely is driven by economic factors then it is possible to estimate which countries are likely to be in that range as we move into the future, through extrapolating the growth rates of GDP per capita in different countries. Fortunately, this exercise of extrapolation is one that is already carried out by the IMF as part of their World Economic Outlook report, which is published every year.

In the second year of our study, we used the 2009 World Economic Outlook (Ref 5) to try and estimate the likely future conflict zones using this method. We produced maps of the world in 2010, 2020 and 2030 with countries highlighted orange or yellow according to their level of risk – as derived purely from their estimated GDP per capita – with 60% of conflicts involving western powers estimated to take place in countries highlighted in orange and a further 30% in countries highlighted in yellow. Thus this was not an exact prediction of which countries were likely to require intervention but instead a broad indicator of where in the world potential trouble might lie.

Figure 2 shows the map for 2010. Of the two additional data points counted in Figure 1 both occurred in areas that were highlighted – Mali is highlighted in yellow in the original diagram and the Gaza Strip in orange. Libya, however, which was certainly a conflict and one that involved considerable commitment of resources, shows up as white. This is not because of missing data: the GDP per capita for Libya was well within the top 5% of the distribution for conflict zones. Interestingly, many of the other countries in the Arab Spring are all highlighted – Yemen, Egypt, Syria and Tunisia are all highlighted, with other countries less affected such as Saudi Arabia, Qatar and Oman all being shown in white, though Bahrain and Libya are also in white. Thus, as a general indicator of where potential trouble might lie, the method seems to work well.

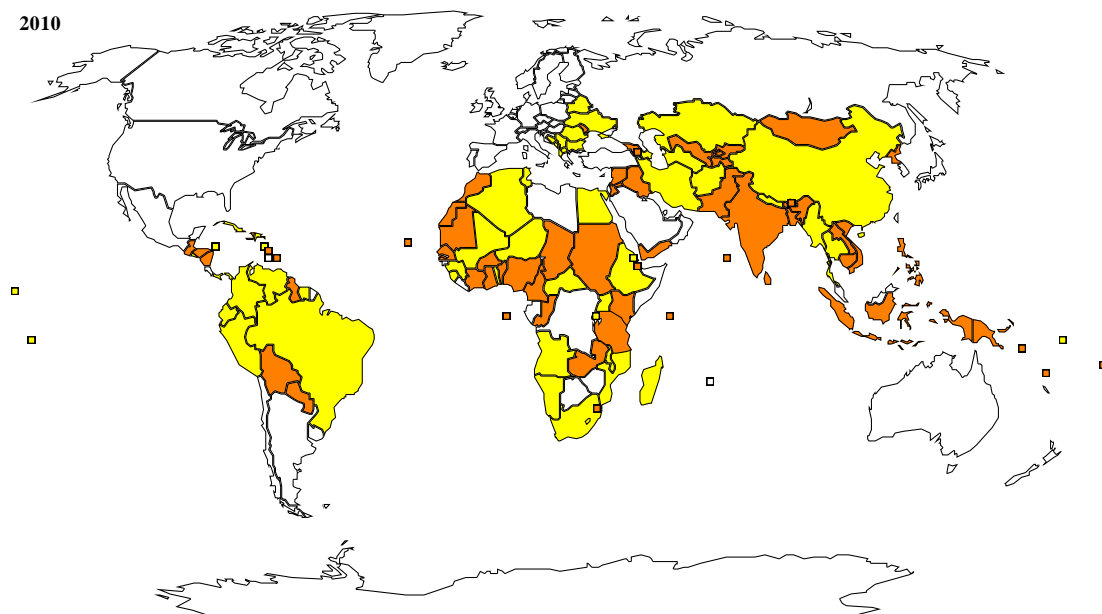


Figure 2 – Risk of Conflict in 2010 based on IMF World Economic Outlook

One question is to whether this problem partly comes from the economic forecasting itself. The Penn World Tables (Ref 6), which were used for the original social dimension analysis, have now been updated to 2010. This means that we can now construct a 2010 diagram based upon actual GDP per capita (at PPP).

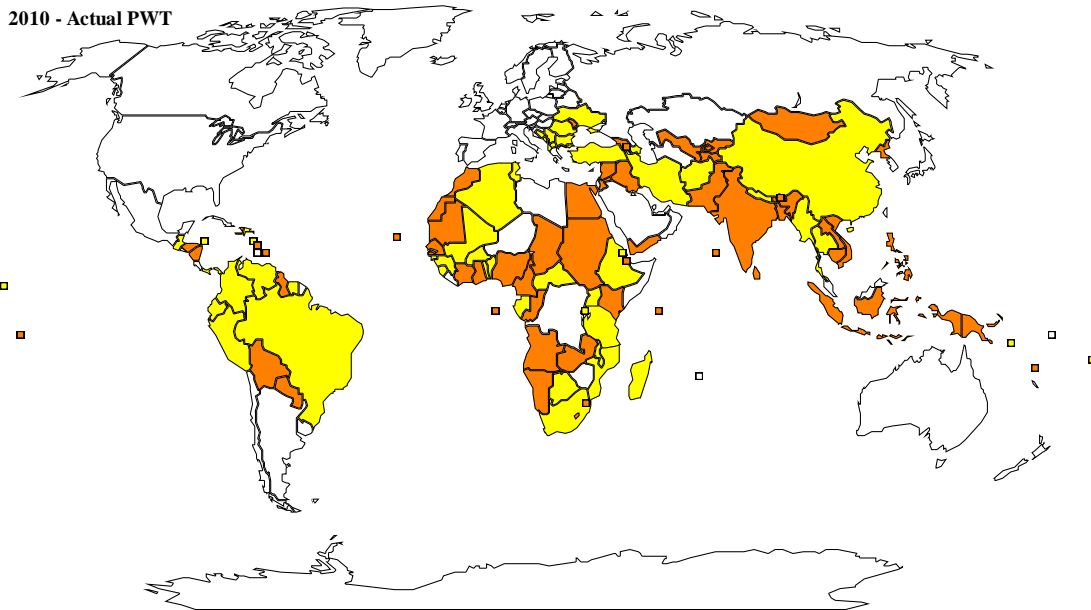


Figure 3 – Risk of Conflict based on Actual 2010 GDP per Capita

This is shown in Figure 3. The shows some differences from the previous version, even over a very short time horizon. These differences include Turkey, Gabon and Botswana moving into the danger zone and Egypt, Angola and Namibia moving from Yellow to Amber. On the positive side Cuba has moved out of the danger zone, together with Costa Rica, Belarus, Kazakhstan and Turkmenistan.

This is quite a lot of difference for only a comparatively short period of time. Obviously economic forecasting is a particularly difficult activity at the moment, with the financial crisis affecting trend rates of growth in Western countries, but it does underline the fact that the sources of uncertainty in economic modelling are likely to combine with our lack of understanding of exactly why this effect occurs to make predicting conflict locations always more of a general guide to areas of the world and potential countries of concern rather than a hard and fast tool.

The second prediction was more of an actuarial estimate than a true prediction, but at the time of the report it was this result more than any other that gave the most heartache and uncertainty.

The end piece of the report was a graph with curves showing the probability of the UK experiencing conflicts of a given magnitude prior to 2035 based upon slightly different assumptions. The original estimate using this graph was that the probability of a conflict in this period exceeding in magnitude the then most extreme MOD planning scenario was between 40% and 75% depending upon the assumptions made. This estimate seemed quite high at the time, and did make this author at least feel somewhat nervous.

The estimate was based upon our evidence for the underlying distribution of conflicts in the resource dimension and the evidence for the frequency of conflict for the UK, at around 1 every 3 years. This allows a simple calculation

of the probability that all 9 conflicts in the period (2008-2035) are below a given level of KIA/Million. Obviously this does depend quite a lot in some cases on probabilities in the tails of the distributions, where the estimates of probability are least exact. Thus we are amplifying the uncertainty in our model, which is rarely a good thing to do. However, it should be noted that the risk over the long term would indeed be strongly affected by the level of the tail risk, which in many ways is the essential problem of defence; being the national insurer of last resort.

As casualties continued to mount in Afghanistan however, it became more and more apparent that the estimate of the probability had been if anything somewhat on the low side – with the level we had stated being exceeded in the middle of 2011.

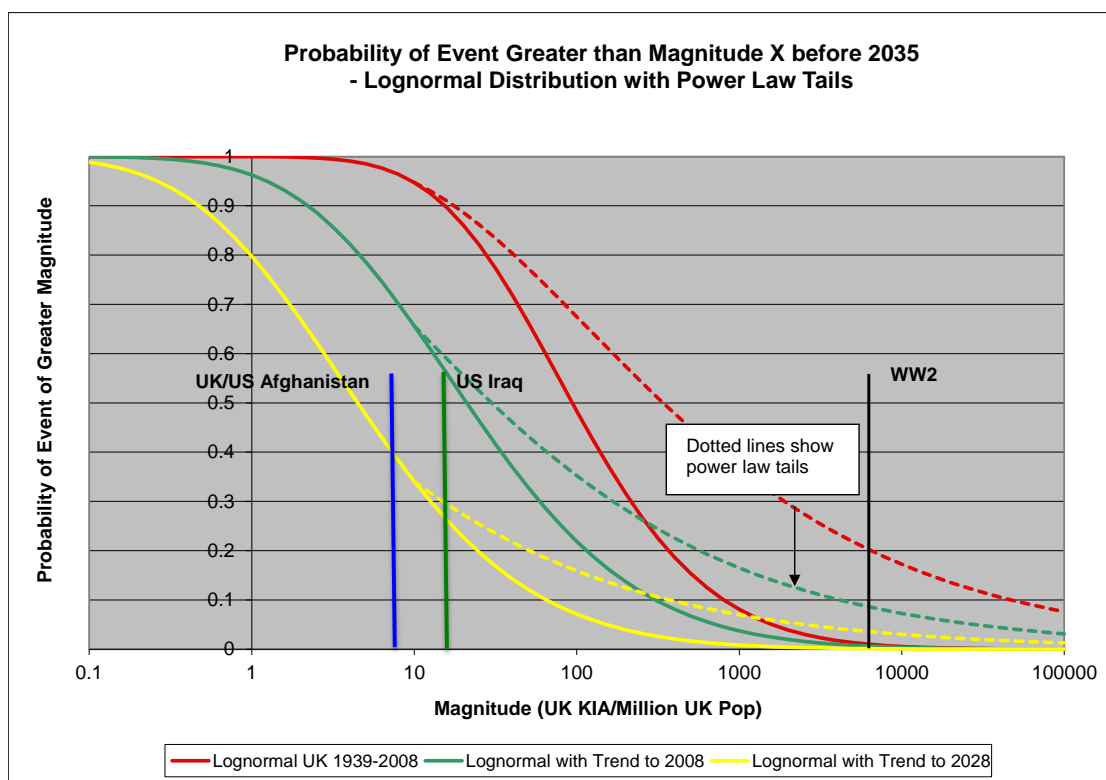


Figure 4 – Probability of Intensity compared with recent conflicts

Figure 4 shows the UK and US experience in Iraq and Afghanistan superimposed on the original graph. There are three different projection curves, based upon the extent to which the trend in the Resource dimension is taken account of. The dotted lines represent the effect of power-laws in the tail of the distribution. Clearly the US experience in Iraq, with 16 KIA/Million is almost certainly into the power law tail of the distribution, which gives some confidence that these tails do need to be taken account of. They have a very significant effect on the very high-end risk – the WW2 scale event. The risk of this over a 30-year period is approximately 5-10%, so the risk is low but not negligible.

Conclusions

Five years is obviously a short period over which to base any conclusions, but in general the themes of the report have held up well, the observation that it is events rather than pre-calculated policy that drive involvement in conflict seems to have been borne out and the large changes in the geopolitical situation from 5 years ago underline the difficulty of assuming that policy and capability constrain involvement in conflict. In the end, nations intervene where they feel their interests to be unacceptably at risk. This is not something that is often apparent beforehand.

The trends in the original report also seem to be holding up to subsequent analysis, with subsequent conflicts falling, probably coincidentally, pretty much along the regression line. Independent evidence has also come to light that seems to confirm the observation of a general decline in lethality levels in conflicts, which was originally quite a contentious observation.

The predictions, which are always the most difficult and dangerous part of the exercise, have had a more mixed performance. The predictions as to conflict locations missed Libya, but correctly identified Gaza and Mali as potential trouble spots. If taken as a broad indicator of where instability might arise however the maps have worked well and identified many of the countries in the Arab Spring as at high risk of turmoil. The prediction as to the likelihood of high levels of KIA/Million has unfortunately already been realised and in retrospect is quite predictable, which is quite surprising considering the angst it generated in the author at the time it was made.

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