Evaluating Claims Costs Arising Out of Political Disorder and Civil Unrest

George Maher, MAAA, FIA, and
John P. Ryan, ACAS, MAAA, ASA, FIA

Scope

As insurers go global, they become more exposed to losses arising from political unrest and terrorist activity. Historically, while many of these exposures were excluded, there is increasing pressure to include them or provide alternative arrangements. Reinsurers are also taking a broader approach to coverages in this area.

This paper discusses coverage issues and ways of estimating PML's, as well as the review of underlying conditions and capital requirements necessary to absorb catastrophe claims. This is done by considering the type of political unrest that is likely to arise in different territories and very large claims or claims of a catastrophic nature. It also discusses techniques for evaluating both the frequency and severity of such claims.

The paper also refers to other financing techniques of the way the reinsurance programmes may be structured to be cost effective in this area. Some other practical issues are also introduced.

The paper builds on the authors' experience of working with a number of specialist companies operating in these types of areas.

Introduction

Conventionally, reserving for insurance companies addresses provisions for claims which have occurred and the adequacy of the unearned premium reserves. The question of capital requirements is seen as a separate issue.

This distinction is somewhat fine in the case of catastrophe pools, and indeed, it is common to apply the term "reserves" to what, for more conventional insurers, is considered capital. A possible reason is that most claims are usually small and settled quickly – although there can be delays in some cases, particularly when it becomes difficult to enter the areas of disturbance. Most importantly, these pools are set up to deal with potentially disastrous situations and accumulate funds over time for that purpose. Management, when considering the adequacy of its reserves, focuses on the funding for those possible events and the issues

here outweigh the considerations around events which have occurred or the elements of unexpired exposures on business already written. By way of illustration, the two pools briefly described later have built up over time significant reserves for these possible claims and the adequacy of those reserves are a key issue for management. It is also relevant that the pools are often the sole or main provider of cover, and so are not diversified and sometimes have limited access to reinsurance protection. They are focused therefore on building up reserves for potential disasters. We have therefore, in this paper, focussed on the overall reserve requirements of the company avoiding distinction between provisions for loss reserves and capital. It is a common approach in life assurance. We shall use the term 'reserving' throughout this paper to cover both aspects.

In many ways the actuarial involvement here can be characterised as the determination of reserves for unexpired exposures and much of the investigations outlined in this report fall under that heading. The long term nature of these pools needs to be borne in mind. While the policies typically have one year terms, reserves are built up for catastrophes which could occur in five or more years into the future and again the thinking is analogous to that underlying the calculation of unearned premium reserves for long term business.

We have concentrated on property damage and business interruption claims. Riots clearly have caused, in many cases, very substantial loss of life. However, coverage of loss of life is seldom if ever included in specialist covers. It can of course be an issue for conventional life assurers. It is relevant that the havoc wreaked by riot and terrorism particularly in loss of life and injury, can lead to exaggerated perceptions of their capability to cause insured property damage. And while some such events have resulted in substantial costs to the insurance industry, the scale is usually orders of magnitude lower than losses due to natural catastrophe. The profitability of the pools providing this coverage often ranks them among the best performers in the insurance industry.

Why then does the insurance industry not see this type of cover as a major business opportunity. The reason is that there is a fear that the political unrest will cause horrendous losses that will overwhelm the industry. This paper provides a better framework within which to make these decisions.

Why are these coverages important?

Provision of political unrest and social unrest cover is essential for the well being of society and the development of social cohesion in society. Where this type of cover is not readily available, financing of housing in some parts of society becomes difficult or, more likely, impossible.

Without insurance of homes and businesses, individuals have very little security. Home owners cannot borrow money as financial institutions will not lend against uninsured property. Businesses can collapse if they are threatened with riot or terrorist damage for which there is no cover, with consequent unemployment. Both individuals and organisations will lose faith in a government that cannot guarantee them the basic security of home and employment.

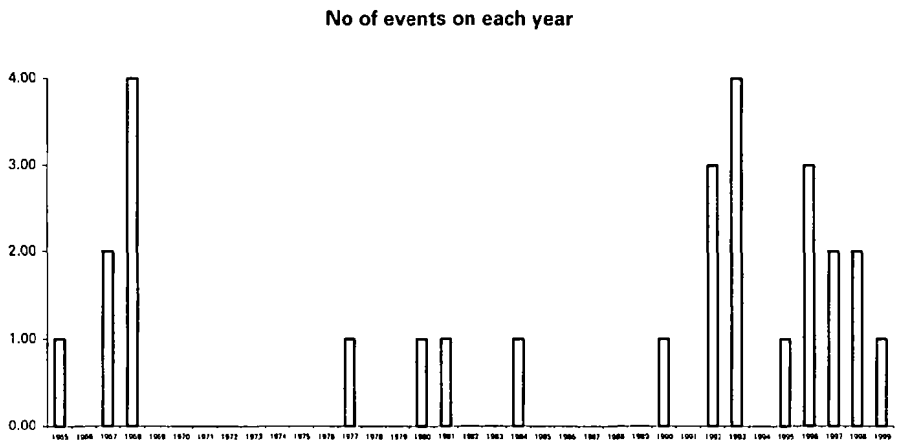
The lack of this form of insurance can have consequences for society as a whole in territories which are subject to unrest or perceived to be unsettled. Such territories are often characterised by inadequate economic and social infrastructure and may be areas of above average unemployment. The additional risk that the absence of necessary insurance creates hinders the influx of required investments.

This affects the poorer sections of community more than the richer. Small shops and other businesses fail to function, leading to further social deprivation. The better off can much more easily rent if no mortgages are available or find other financing mechanisms. The poorer in society are unable to take these options which leads to a downward spiral. Consequently, ready availability of insurance in times of social unrest becomes increasingly important as means of economic development. This is a factor not just in the USA but in many other parts of the world including Western Europe and, of course, many third world countries. Social unrest issues need not reflect purely social deprivation but include terrorist and other types of political activity but the economic consequences are the same.

It is not only the above aspects that make this an area where actuarial work on solutions is important. It is also that this is a "growth area". As the world gets more complex, social divisions increase. Modern market economic theory tends to encourage wider diversity of wealth. This creates social divisions and can cause problems. It is relevant to note that it is the relative divisions that create the problems rather than the absolute level of wealth of the poorer section of society. Modern communication systems mean that people in the four

corners of the earth are aware of what living standards are potentially available and will find it unacceptable if they miss out to any marked degree.

The following graph shows the distribution by year of the numbers of major riots and terrorist insurance claims. The increased frequency of these events following the relative calm of the 1970s and 1980s demonstrate the increasing importance of this coverage.



As indicated later, over 70% of these major insurance claims relate to US and UK riot and terrorist activity. Both of these territories have produced government sponsored reports which provide much valuable background information.

A number of studies of the causation of various riots (for example the Brixton riots in London or the riots which occurred in the US in cities such as Detroit) highlight relative poverty or deprivation as a key causation factor. Sections of societies, with living standards with which others elsewhere are content, become discontent when they perceive substantially higher standards being enjoyed particularly by those who live in close proximity. An exacerbating factor can be the absence of any exit route from relative deprivation which arises typically because of political exclusion or exclusion from the classical routes to self advancement such as education or access to parties within the wealth generating sections of society in the world.

The lack of insurance coverage in such situations exacerbates the problem. It increases the desire of the wealthier individuals to leave the areas concerned, and substantially reduces the availability of finance for domestic properties and local businesses, hinders the attempts of the communities at self advancement and reinforces the message to those communities that they live in "undesirable" areas. Indeed, the Congressional committee which reported on the US riots of 1967 identified insurance cover as an important factor requiring consideration, if those riots were to be avoided in the future.

The rapidly increasing wealth of parts of the world including the US, Western Europe and parts of South East Asia and the much slower advances in other parts of the world is increasing divisions and advances in communication will heighten awareness of these differences. This is a These are trends that is are only likely to increase in the foreseeable future. Social division and lack of education will exacerbate these conditions.

The Characteristics of Covered Events

It is important to take a systematic approach to evaluating the risks arising out of social and political unrest. While this affects the evaluation of both frequency and severity issues, the severity issue is much the more important one for the purposes of reserving. Major disasters, which are the events for which the reserves are essentially held, are associated with extremely low frequency when compared with conventional insurances and annually the number of events worldwide rarely exceeds two. Attritional claims are common and readily funded from premium income, and indeed the loss ratios for this business are without doubt amongst the best in the world insurance industry. The focus of the analysis is therefore on the severity issue and the questions of how adequate the reserves are for small numbers of such events. Clearly, the reinsurance available is also a necessary consideration.

We have categorised four different types of event that need to be considered separately and the quantification of each is very different. In most cases the environment is only susceptible to one or possibly two of these types of activity.

The four types of event that we have separately identified are as follows and we will discuss each of these separately.

(a) Terrorism.

(b) Riot.

(c) Labour Unrest.

(d) Insurrection.

Terrorism

A terrorist problem is typified by a group of people intent on creating significant amounts of property and structural damage in order to achieve a political end. In many cases bodily injury is not the principle objective and the major impact is intended to be the property damage. The extent of property damage can be very severe. Indeed the aim of the attack is to generally maximise that problem usually regardless of any associated loss of life. Bomb blast and other issues clearly will do damage to the buildings that are targeted and the cost to those individual buildings can, in general, be evaluated in much the same way as any other property damage case estimate. A major difference here is the structural damage created by the bomb blast in other buildings and the extent to which such buildings are suitable for ongoing use. There will also be an impact of changes in rent levels if there is widespread damage. For example, the IRA bombs in London had a significant impact on rent levels. Prior to the Commercial Union building attack, rent levels were dropping in the City of London. The loss of property space increased utilisation of much of the spare capacity and led to a reversal of that trend. This factor can lead to increases in costs but where premium is assessed as a function of values, can also generate higher income.

Where the event has not yet occurred, models capturing details of the buildings in the area concerned and their characteristics (height, construction etc) and the characteristics of the explosions need to be developed. In order to have estimates of the overall reserve requirement, it is also necessary to have a clear idea of the exposures within a particular area and how one building might shield another.

Certain conditions need to exist for there to be any material likelihood of terrorist activity. There is always a risk of an extreme isolated lunatic attack and that is really outside the scope of this paper. In such cases the sums insured are not usually that material, although loss of life may be. In most cases, however, the terrorist activity is not directly related to social deprivation as with some with the other types of claims described below, although social deprivation and political exclusion may provide the usually small groups involved with support networks and financing. It does need to have a strong political cause and often there has to be a reasonable degree of sophistication within the terrorist group in order for

them to be able to achieve their ends. Extremes of social deprivation generally do not give rise to terrorist activities. In assessing the risks, it is usually clear as to whether there is any strong risk of major terrorist activity.

Issues that need to be considered are the degree of organisation of the terrorist group, their public pronouncements, as well as the security attitudes taken by the state. The severity in any one event can be very substantial. Some of the terrorist losses approach $2 billion and can be concentrated on certain particular insurance companies if care is not taken to manage this risk and exposure.

Riot

This is a very different type of risk to terrorism in that it is generally a random event that is triggered by often quite trivial causes. For example, the immediate cause of the Brixton riots in the UK was a knife attack. The action of a policeman rendering first aid was misinterpreted by the mob as being the preventing of the injured person from being transported to hospital. Other riots have been triggered by relatively trivial incidents – one hysterical individual running down a street. There are elements of chaos theory which may well be applicable here. Social economic and political circumstances generate situations of deepening tension, creating an unstable system. An otherwise trivial event serves as the trigger which moves the system into chaos. The crowds then readily get out of control and create a significant amount of damage in the areas in which the riot occurs. These areas are usually relatively socially deprived and therefore do not contain the most expensive property. In most cases, there is no targeting of damage and it is simply a matter of a large number of people out of control.

We have investigated the historical costs of riots adjusted for different property values in different parts of the world. This shows relatively small amounts of insured damage created by events that generate very large amounts of publicity.

Essentially the conditions required for a significant riot risk require a section of the community to feel that they are being excluded from the main body of society. This usually arises out of social deprivation but can arise from other causes such as race or religion if there is discrimination. Within a particular geographic area, it is usually relatively straightforward to identify the areas where riots could occur. For predicting severity, one needs to consider the potential for losses in the most vulnerable area.

In estimating the reserve requirement, it is important to recognise that riots tend to be disorganised and uncontrolled random events and not all buildings get damaged systematically in an area. The amount of PML will, therefore, be significantly less than the total values of property covered in the area concerned. Inevitably the property damage is within a confined area since once the crowd moves out of the confined area then its energy rapidly dissipates and its power to do damage declines sharply. These events run for relatively short periods of time, usually not much more than 72 hours.

After the event has occurred evaluation is essentially straight forward property claims adjustment, but allowance does need to be made for the fact that usually it is the lower income areas that are affected by this where there can be a substantial degree of under insurance or no insurance.

Labour Unrest

These types of activities have much in common with riot situations; in that they are usually relatively disorganised but tend to have less public participation and be of longer duration. Unlike riot risk, however, they are usually highly focused in a geographical area and against a particular target; usually the employer or government depending on the nature of the labour unrest. For these types of claims to arise there has to be a labour issue in place. Consequently, it is relatively straight forward to anticipate the areas of potential exposure and the insureds who are likely to be affected. After the event has occurred it is usually fairly straightforward to use conventional property claims estimation techniques to evaluate the cost and the insurance issues are normally fairly clear with the possible exception of coverage. In practice, it can be difficult to determine whether an event should be classified as a riot or as a labour disturbance which has led, in some cases, to the extension of riot coverage to include labour disturbance. The concentration of the wrath of the mob against a particular target also usually makes it easier to identify the insureds involved and hence the possible costs.

The conditions for the activity to take place require some form of division in society giving rise to disaffected labour. Negotiation over an individual renewal of a labour contract does not normally give rise to major losses in this area. There may, of course, be a few isolated incidents of stone throwing, but these do not generally give rise to material claim amounts. Usually significant problems arise in this area when political change is having an adverse impact on organised labour. Rapid technological change or cutting closing down large

plants can also give rise to these conditions. The disturbances do not generally arise in isolation and an assessment of the risk of labour unrest arising is normally fairly straightforward.

Insurrection

In this case, the damage can be very extensive because it involves a widespread move by a significant section of the population against the authority of the day. It clearly requires significant political unrest and also requires systematic retaliatory action on the part of the authorities in some area. It can also be caused if a particular political vacuum arises e.g. the assassination or death of a dictator, with various factions fighting to obtain control of the country or the relevant authority. The sums involved can be very significant. However, in many cases, because of the size of these types of losses, insurers will opt either not to provide the cover or to cancel it if there is any material likelihood of loss in this area, due to the sheer potential. Timescales can be much longer than riots.

Additionally, In these circumstances it is more likely that mobs will move from the area of disaffection to the areas of wealth i.e. they tend to display more directed behaviour than mobs in riot situations who tend to turn their energies, randomly, on the nearest targets. The target, in the case of insurrection, will often be government or other symbols of authority. If these are not insured, the cost to the insurance industries is significantly reduced and material claims will not therefore arise. However, it is likely that there will be significant disorder in the areas concerned and therefore the actual claims estimation process may be somewhat complex or indeed impossible. It may not be possible for example to estimate the cost in that area until after events have settled down, creating particular case estimation problems for this type of event. There may also be reinsurance issues as the time scale over which the event occurs may be open to debate and the aggregation of claims as one event may also be an issue.

Additionally, it should be noted that coverage in this case often includes cancellation clauses claims enabling insurers to withdraw coverage (after a specified number of days) in cases where the situation deteriorates.

What risk transfer mechanisms currently exist?

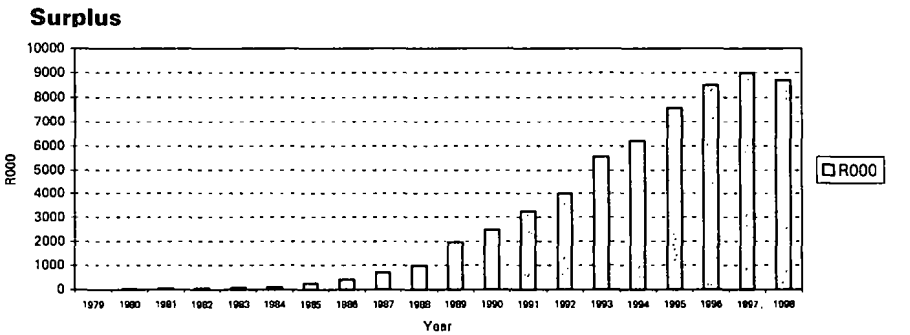
In this section, we give a brief history of two large pools which provide this type of cover, in order to outline some of the characteristics of the pools generally.

SASRIA – a brief history. The South African Special Risks Insurance Association (SASRIA) was set up in 1979, following the Soweto riots and ensuing political volatility, to underwrite the risks that the conventional insurance industry was unwilling or unable to take on. It is funded by premiums applied to policies offered by SASRIA, but issued on their behalf by the domestic insurers. Over time, SASRIA built up a substantial surplus of around R10bn.

As a result of the political normalisation of recent years, the South African government is changing the status of SASRIA from a not-for-gain organisation into a state-owned company with a determined adequate capital requirement. The intention is that SASRIA be privatised.

Coverage is for fixed policy limits, which aggregate across all subsidiaries in a group and is provided on a non-refusable non-cancellable basis. Coverage excess of SASRIA limits is purchased in the external market. SASRIA has built up substantial funds out of retained earnings over the period 1979 to the present. This period covered a time of considerable political turmoil in South Africa and the current mechanism proved robust and profitable in that environment. As SASRIA's surplus increased and the political environment changed, premium rates were reduced and limits were increased.

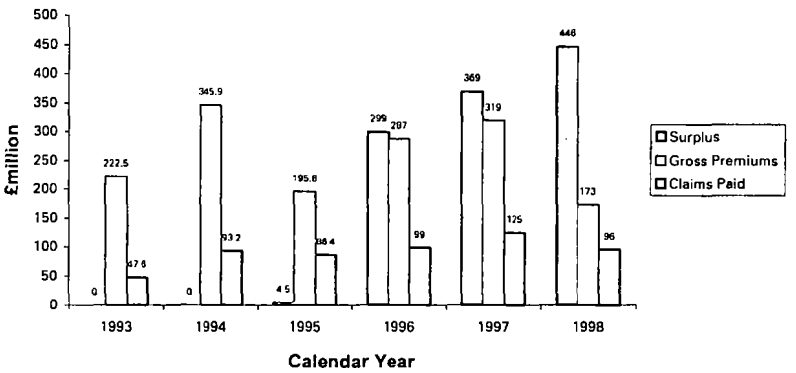
The following graph illustrates the profitability of the pool. While SASRIA has paid a large numbers of claims, none has been significant relative to reserves. SASRIA widened coverage which originally did not include labour disturbance. The mechanism has proved highly successful in ensuring that coverage is available to all sections of society regardless of any perceived risk. Initially the pool was backed by government guarantee but with the increased reserves this has now to been withdrawn. Indeed following external consultation as to the required level of reserves, capital was released to reduce National debt in 1999.



Pool Re. Pool Re was established in 1993, following the IRA bombs in the City of London. The cost of claims arising out of the damage caused led reinsurers to impose exclusions and there was concern that basic coverage would be unavailable or prohibitively expensive. Unlike SASRIA, Pool Re was established as a reinsurance company and provides reinsurance coverage to 182 companies and 37 Lloyd syndicates.

Losses are payable from premiums collected, additional levies and accumulated surplus and finally a HM Government retrocessional agreement, which is effectively a government guarantee. If an underwriting year generates an underwriting loss then Pool Re can levy its membership to a maximum of 10% of premium. Losses beyond that are funded from accumulated surplus. Should the accumulated surplus prove insufficient, the retrocessional agreement with HM Government is invoked.

The following graph summarises key financials.



The company reports under the three year accounting convention and the profits of a particular underwriting year are deferred for three years. As of 31 December 1998, no loss had been identified for the 1997 and 1998 underwriting years, and the excess of premiums over claims has been held in an insurance reserve. Effectively this is a deferral of profits. The amounts held are £0.2 billion for the 1997 underwriting year and £0.1 billion for the 1998

underwriting year. Surplus including these amounts is £0.8 billion as at 31 December 1998, after rounding adjustments.

While Pool Re has paid claims on a number of occasions its premium income has substantially exceeded claims and as with SASRIA it has generated significant reserves over time. The reduction in premium income in recent years is partly a result of loss of business through competition but also of reduced rates.

In the case of SASRIA, basic coverage must be bought from the pool and only cover excess of limits offered can be purchased in other markets. In the case of Pool Re, reinsurance cover is available but not compulsory and there are competing markets who provide similar coverage although they often restrict their underwriting to certain areas.

MODELLING

The approach that we are advocating is identification of the conditions of social unrest and the types of event that might occur. Following that, one can then examine the impact of the particular type of event and the likely loss costs. For reserving purposes, frequency does not change dramatically in the short term though it can have a bigger impact on rating in the longer term. It is usually only necessary to provide for at most one or two catastrophic events and the key task is to estimate the severity. In any analysis of this nature, it is important to split the exposure into the types of events which need to be considered and to then undertake the appropriate analysis.

In this section, we describe the investigations that need to be carried out. Specifically we discuss:

- Identification of Key Risk Factors
- Analysis of Historical Experience
- Review of Global Experience
- Generation of Possible Scenarios

The first subsection sets the framework for the analysis. The remaining subsections generate possible loss costs leading to a selected reserve. In practice, the basis on which the reserve is selected depends on the results of the investigations.

Identification of Key Risk Factors

Discussions with local experts, including insurers, to ascertain their views on risk factors is often helpful. Thinking through catastrophe exposures is a normal part of the insurance mindset, as is the understanding of risk. Equally, these meetings provide valuable background information on the political and economic condition of the country concerned and supplement desk top research.

The desk top research and industry discussions help in understanding what the key risk factors are. The factors might be:

a) Failure of government to meet peoples expectations, whether reasonable or not.
b) Failure of key components of infrastructure.
c) Fall in the price of an important commodity.
d) Increased student unrest.

Having identified key potential causes, it is possible to form views as to the significance of each as a contributor to major insured property damage. Some of these may be eliminated. For example, at current prices, each fall in the price of gold can trigger redundancies in the South African goldfields, with knock-on social and economic effects: each employee supports on average ten dependants. However, the people most affected live in the countryside, or outside the main towns and cities. The damage they can cause by rioting and arson will therefore cost less than it would in a city centre.

Analysis of Historic Claims Experience

Major claim causes can be subdivided into two different types. The first arises from large scale disruption as a result of crowd violence whether caused by a riot or labour disorders. The second is predetermined violence arising out of some form of terrorist activity. The distinction between the two is important for insurance purposes. A clearly planned terrorist attack is often designed to maximise the property damage concerned. Crowd disorders, almost by definition, are unplanned and usually arise out of basic unrest often from people without substantial stakes in society. The damage usually takes the form of looting with associated property damage arising from crowds getting out of control.

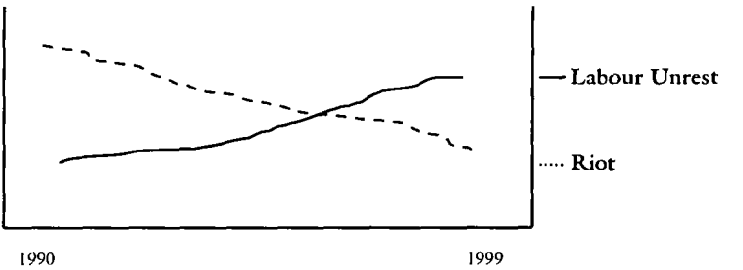
Riots invariably arise out of uncoordinated and irrational behaviour. They were often dependent upon the interaction between rioters and police, usually with some form of failure in communication. The time span varies but typically does not exceed 72 hours. There is scope for them to restart particularly through linked riots in other locations but generally they were sporadic in nature. The characteristic irrational and uncoordinated behaviour limit the damage potential.

In practice, the historical data available to the Pool is limited since the claims experience typically relates to attritional claims. Establishing classic IBNR claims reserves is straightforward and the standard actuarial triangles are easily constructed and analysed. With the exception of a few claims, where access to the areas of disturbance is difficult, case

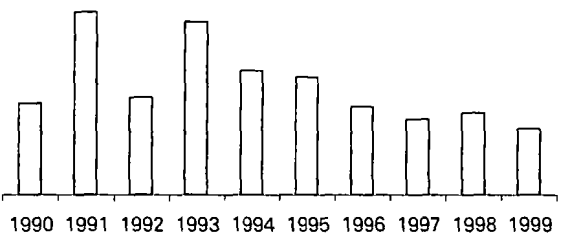
estimates are readily established. For some pools (for example where claims management is contracted out) there may be significant delays in notification. This is the main cause for tail development for these claims, which are otherwise short tailed.

While the data is limited (since it almost invariably relates to attritional claims) nevertheless suitable analysis can generate valuable reserving insights.

Tabulations of numbers of claim by claim type provide guidance to the overall trends.



and tabulations of costs per claim may add some insight although usually it is limited since these costs fall well below likely reserve requirements but may generate insights into underlying trends.



Specific factors which reduce the value of such averages include the effect of policy limits, which generally change over time, and restating claims to current policy limits is a useful addition.

Most benefit can be derived from a review of the largest situations focussing on what could have gone wrong – but did not. A detailed review of the circumstances of each such incident,

the location of the actual destruction and factors which could have led to higher values generates sets of "what if" scenarios. Such factors include what if the authorities had not been forewarned, what if the riot had extended in one direction rather than the one it took, what if buildings had been totally rather than partially destroyed.

Analysis of Global Experience

The largest terrorism related insurance claim over the same period is the IRA bombing in the financial district of London in 1992 with insured costs of US$1.4 billion. However, the claim occurred in a highly concentrated area of expensive property. The largest aggregate insurance loss arising from a series of related riots, this century, is the Los Angeles riot of 1992 with insured costs of US$ 0.9 billion, in current money terms.

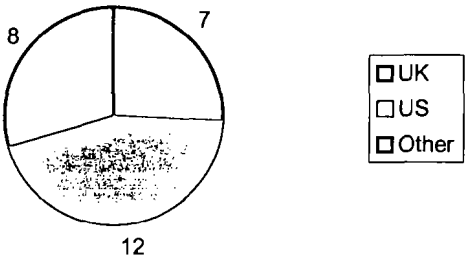
The table below shows present values insured for areas affected by acts of terrorism and rioting in the last 30 years.

TERRORISM AND RIOTS
BROUGHT TO 1999 VALUES

Year	Country	City	Present Value – Insured ($m)
1992	UK	London	1,447.7
1992	USA	Los Angeles	922.0
1993	UK	London	854.1
1996	UK	Manchester	698.7
1993	USA	New York	687.6
1996	UK	London	686.7
1998	Kenya & Tanzania	Nariobi & Dar es Salaam	508.6
1999	Jamaica		322.0
1998	Indonesia	Medan	255.2
1965	USA	Los Angeles	232.1
1967	USA	Various - esp. Detroit	206.4
1995	USA	Oklahoma City	136.8
1980	USA	Miami	131.2
1968	USA	Washington, D.C.	114.9
1996	USA	Atlanta	105.9
1992	UK	London	90.4
1977	USA	New York	77.4
1990	Trinidad & Tobago		76.5
1967	USA	Newark	74.6
1993	Germany	Weiterstadt	67.1
1968	USA	Baltimore	67.1
1968	USA	Chicago	62.3
1997	Norway	Drammen	36.6
1968	USA	New York	20.1
1981	UK	London	8.3
1984	UK	Brighton	7.9
1993	India	Bombay	5.8
1997	Colombia	Apartado	1.6

Source: Sigma reports with monetary values restated.

The following graph shows the split by territory.



There are significant differences in the impact of these events when measured in terms of destruction of property and when measured in terms of loss of life or injury. A number of riots which have resulted in relatively low insured property damage have however caused significant loss of life and injury and riots are typically associated with these well publicised disturbances. There may well be a difference between the perception of riot costs and the actual property damage costs, which are generally small and even at the extreme less than the costs of major natural catastrophes.

Clearly, property values differ significantly across the world and two buildings of similar construction one in the centre of a western world capital city and the other in a town in a less developed country will have significantly different values. A number of adjustments need to be made to the costs shown in the above table before they are fully relevant for reserving purposes.

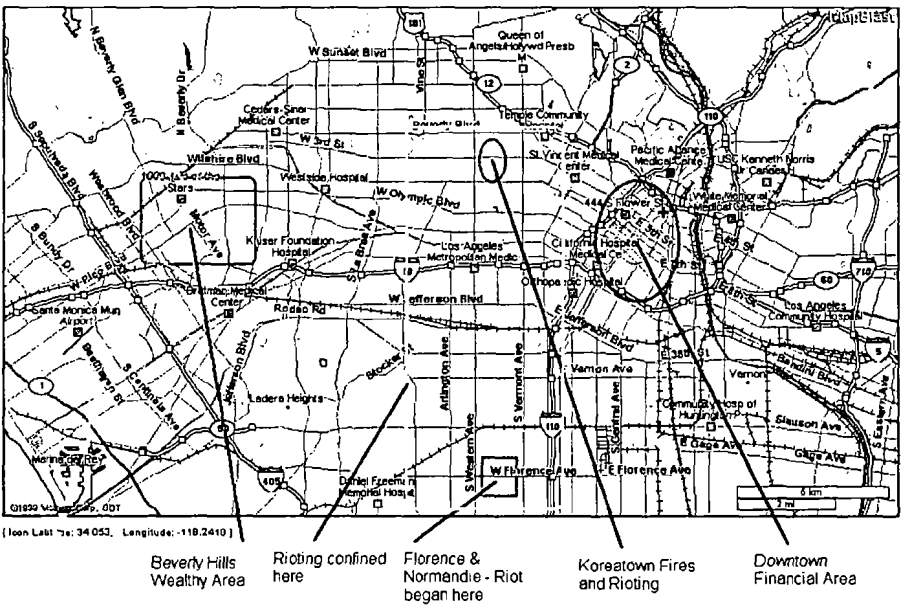
Equally, there is a need to restate the insured costs to current money terms. Additionally, consideration needs to be given to differences in rebuilding costs. Possible ways in which to make the adjustment are to compile details of land or a rental values for the territory concerned and the areas in which the historic events occurred. Some care needs to be taken since these values vary widely within cities.

Further adjustment needs to be made to allow for different insurance buying patterns. Insurance claims will clearly be higher where there is a higher propensity to insure and restating for differences in this aspect can have significant impact, particularly when comparing western world events with third world situations.

Consideration of the general features of the individual disasters and the extent to which they may be reproducible in the region concerned may indicate that further adjustment factors should be applied.

By way of illustration the following map shows the location of the Los Angeles riots.

Los Angeles, CA



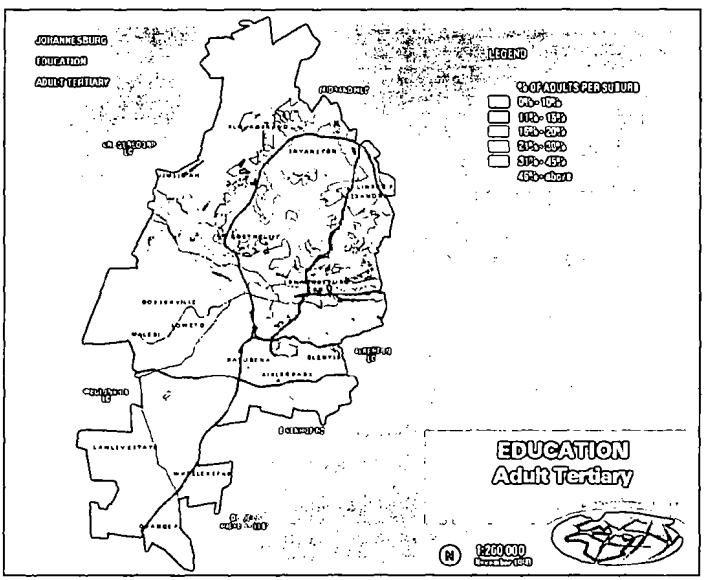
The riot caused heavy destruction of properties and resulted in extensive looting in the area indicated but did not breakout to either the financial district or wealthy areas such as Beverly Hills, which is a pattern already referred to. In considering the reproducibility of this situation comparison of Los Angeles with major cities in the territories concerned will likely generate adjustments to restate the Los Angeles riot costs to generate equivalent value. In the case of this situation the factors are almost invariably less than one.

The outcome of this analysis is then a table of world insured disasters restated for:

- Change in money term values
- Differences in rebuilding costs
- Insurance buying propensity
- Demographic conditions

Generation of Possible Situations

Those most likely to riot tend to have below average life expectancy, educational achievement and medical care and feel excluded from wealth and power. Triggers for crowd violence can include economic factors (for example, the closing down of a mine in South Africa) or social / political frustration (for example, as a result of people feeling that the process of change is occurring too slowly). Location is important. Large groups bent on arson and destruction based hundreds of miles away from large commercial city centres create a smaller potential insurance risk than those living close to prime commercial property area. Research into these areas including site visits are useful. Again, graphic representation can assist in the thought process.



The above map identifies areas of Johannesburg showing educational levels. Similar graphs can typically be produced showing other social economic indications including average income per household and other standard of living measures.

A number of reports have been produced on the conditions underlying disturbances which have occurred in the past. A degree of caution needs to be exercised since the objectivity of a number of papers in this area is sometimes doubtful. Reports which the authors have found useful are the US Congressional committee investigation into the 1967 US riots and the UK report on the Brixton riots. Some of the insights gained from these reports have been noted in earlier sections of this paper.

Studies of the demographics of the territory and consideration of the conditions identified in such reports help in focussing on the potential areas of unrest.

In evaluating the potential costs of disturbance, further graphs showing concentrations of expensive properties are helpful, together with a review of the extent to which disturbance in the areas of potential unrest could reach to those areas. Factors to bear in mind are that in riot situations, the energies of the crowd are randomly directed and applied and while disturbance can suddenly flare up they seldom extend beyond 72 hours. There may also be physical limitations restricting the movement from the areas of unrest to the areas of potential maximum destruction. And indeed, the energy of the crowd may have been dissipated to such an extent that any damage caused is limited.

As noted in the previous section adjustments then need to be made for the likely level of insurance cover, as well as the application of policy limits.

Not all policies cover full loss of profits. Some, for example, cover standing charges only and these features need to be factored into the costing of the potential insurance loss.

In evaluating the possible terrorist damage, research into demographics is less useful and the focus is on the concentration of expensive properties. It is worth noting that the general background research into social economic conditions as well as the political situation usually leads to a focus on one or other of riot and terrorism as the key area of exposure.

Detailed databases of the location of properties, their characteristics and insured values are usually required for the analysis of terrorist costs. The approach is, in general terms, similar to that used in catastrophe models where databases of insured properties are created,

possible hurricane paths and characteristics are generated and interactions between the two are modelled. In this case potential explosive forces need to be modelled and the interaction on surrounding buildings analysed. A key factor here is often the extent to which one or more buildings shield others.

CONTROLLING AND MANAGING RISKS

From the insurance standpoint there are a number of practical ways in which the insurance risk can be managed.

Some commercial covers are cancellable usually after a short period of time in a manner similar to war coverage. The effect of this is that the exposure is only for a short time, which therefore needs to be considered in the modelling.

It is usually the case that the policy offers limited coverage. These limitations can be quite restrictive in practice. In some cases the limit applies to all property owned by the ultimate holding company with the effect that insured losses are very small percentages of actual losses. Indeed limits are used actively in the risk management and their use is as important as the use of rate increases. As conditions improve, limits are often increased widened and rates are decreased - with the opposite effect occurring where conditions deteriorate.

Reinsurance is also key to the management of risk. But the general structure of these pools needs to be kept in mind. Typically reinsurance is readily available when the situation in the territory calms down and becomes difficult or impossible to procure if the situation deteriorates. Often government intervention is required in very difficult conditions.

Financial modelling over a five year time frame, for example, focussing on the interaction between availability of reinsurance and the build up of reserves can help. These models use different scenarios for example, mild deterioration in conditions, sharp deterioration with one major claim and so on. Much of the necessary parameters come from the analysis previously described. When conditions deteriorate, the pool has typically available to it the ability to sharply increase premium rates and, if necessary, reduce limits and these need to be factored into the model and offset the reduction in reinsurance availability.

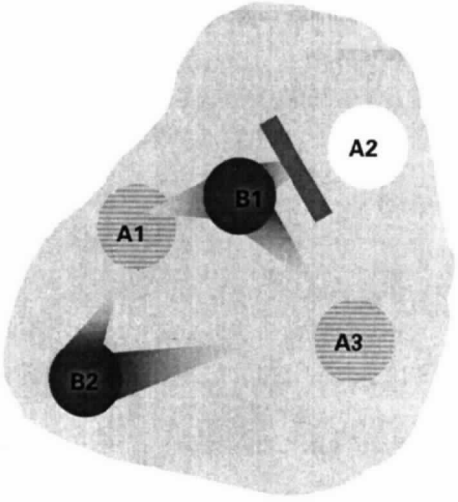
Mixtures of cancellable and non-cancellable reinsurance may provide the necessary cover. For example, there may be insufficient capacity to provide the full amount of required cover but additional cancellable cover may be available and appropriate.

Some care in the drafting of the cancellation clause is necessary since the situation where cover is cancelled shortly before the occurrence of the major disaster is to be avoided. Aggregation clauses also required careful drafting.

Perhaps the most important aspect here A new tool that is becoming available is securitisation. The territories concerned have typically significant amounts of overseas investor involvement in a number of different ways and capital markets are adept at evaluating the political risk. Construction of suitable securitisation products is a so far untested solution to the permanent reinsurance capacity question and may well prove a developing area for actuarial involvement.

CALCULATION OF RESERVE REQUIREMENT

The following diagram summarises the results of demographic and other research leading to final reserve selection. In this diagram we illustrate the areas of potential high value destruction (A) and the areas of potential riot (B). As noted earlier, the short term nature of individual riots needs to be factored into the analysis and whether or not the energy of rioters will have dissipated prior to their reaching the areas of maximum destruction.



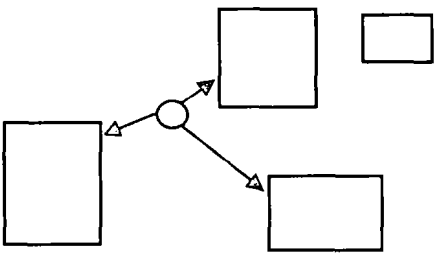
A1, A2 and A3 are areas of high value properties or areas where there is potential to cause extensive damage. B1 and B2 are riot prone areas identified following the investigations described in the preceding sections. While riots could occur in B2, the distance from the high value areas is such that the energy of the riot will have dissipated before the riot reaches any of A1 and A3, and A2 is too distant. Rioters from B1 could reach A1, it is unlikely they would reach A3 and there are physical obstructions which prevent them reaching A2.

The area most exposed is therefore A1. For A1 a database is constructed of insured values and calculations carried out as shown below in highly simplified form.

Insured	Property Type	Property Value	Destruction Factor
I_1	A	P_{11}	F_A
I_1	B	P_{12}	F_B
I_1	A	P_{13}	F_A
I_1	C	P_{14}	F_C
I_2	A	P_{21}	F_A
I_2	B	P_{22}	F_B
I_3	C	P_{31}	F_C
...	...	...	...
...	...	...	...

Each insured property in the area is identified and collated by insured party, together with details of construction and separate amounts for buildings and contents. The expected PML is then calculated by the application of destruction factors. High destruction factors are used for contents, glass and furnishings. Low destruction factors are used for concrete infrastructure.

The basis of calculation for terrorist activity is somewhat different. Again the areas of high value properties are identified but at a micro level.



In this case the focus is again on identifying areas of high value property but in much smaller areas. The modelling is then of the potential damage to buildings given the relative position, construction of buildings and explosive forces.

Ordinance survey studies and experts knowledgeable in the effect of explosions are required. The impact of a bomb placed in the location indicated and with a specified explosive force is

calculated. Various permutations of location and type of explosive device are required to generate the realistic disaster scenarios.

In order to determine reserves, further analyses are required as illustrated in the following tables. Essentially, total reserves of the company are to be such that the company can meet disastrous claims and continue to be viable. The following table shows a set of possible scenarios.

Scenario	Description
1	Large Loss Followed by Poor Conditions and then Another Large Loss
2	Large Loss Followed by Competitive Conditions and a Large Claim
3	Several Years Good Experience Followed by a Large Loss and a Sharp Deterioration in Conditions
4	Most Likely
5	Optimistic
6	Pessimistic
7	Major Loss Followed by Poor Conditions and then Another Major Loss

The following table identifies reserves at the end of each year under the different scenarios. Key inputs are possible claims costs under the various scenarios and these are illustrated in the following tables. The reserve requirement is established so that the company survives all identified realistic disaster scenarios.

Total Reserves End of Year					
Scenario	Year 1	Year 2	Year 3	Year 4	Year 5
1	9,397	9,321	8,968	4,572	4,059
2	9,397	9,126	8,950	3,881	2,967
3	10,213	10,333	10,356	5,414	4,544
4	10,213	10,238	10,165	10,048	9,907
5	10,213	10,333	10,356	10,334	10,402
6	10,213	10,048	9,780	5,393	4,744
7	6,454	6,382	6,032	1,604	1,106

Essentially the reserve requirement is such that the company must be able to withstand these scenarios. The following tables show the modelling of results under each of these scenarios capturing the following effects:

- Claim costs
- Withdrawal of some reinsurance capital
- Increase in premiums charged to policyholders
- Increase in reinsurance premiums

The selection of appropriate scenarios is based on the study of demographics and possible solutions as outlined previously.

Scenario 1
Large Loss Followed by Poor Conditions and then Another Large Loss

Gross Premiums	750	1,500	1,500	1,500	2,250
R/I Premiums Payable					
50-500M Non Cancellable	38	580	184	614	614
500-1000M Cancellable	9	0	0	94	0
Securitisation 1-2B	150	150	150	150	150
Total R/I Cost	197	730	334	857	764
Net Premiums Written	553	770	1,166	643	1,486
Investment Income	491	474	467	337	219
Regular Claims	188	938	1,875	1,875	2,250
Catastrophe Claims	3,563	0	0	9,375	0
R/I Recoveries	1,950	0	0	1,950	0
Net Claims	1,800	938	1,875	9,300	2,250
Expenses	75	83	90	98	105
Net Profit	(831)	224	(332)	(8,418)	(649)
Dividend Payable	188	188	188	188	188
Reserves B.O.Y.	10,000	9,397	9,321	8,968	4,572
Reserves E.O.Y.	9,397	9,321	8,968	4,572	4,059

Scenario 2
Large Loss Followed by Competitive Conditions and a Large Claim

Gross Premiums	750	563	375	188	1,500
R/I Premiums Payable					
50-500M Non Cancellable	38	580	184	614	614
500-1000M Cancellable	9	0	0	94	0
Securitisation 1-2B	150	150	150	150	150
Total R/I Cost	197	730	334	857	764
Net Premiums Written	553	(168)	41	(670)	736
Investment Income	491	458	448	303	166
Regular Claims	188	375	375	1,875	2,250
Catastrophe Claims	3,563	0	0	9,375	0
R/I Recoveries	1,950	0	0	1,950	0
Net Claims	1,800	375	375	9,300	2,250
Expenses	75	83	90	98	105
Net Profit	(831)	(168)	24	(9,764)	(1,453)
Dividend Payable	188	188	188	188	188
Reserves B.O.Y.	10,000	9,397	9,126	8,950	3,881
Reserves E.O.Y.	9,397	9,126	8,950	3,881	2,967

Scenario 3
Several Years Good Experience Followed by a Large Loss and a Sharp Deterioration in Conditions

Gross Premiums	750	563	375	375	1,500
R/I Premiums Payable					
50-500M Non Cancellable	38	37	34	629	614
500-1000M Cancellable	9	9	9	94	0
Securitisation 1-2B	150	150	150	150	150
Total R/I Cost	197	196	193	873	764
Net Premiums Written	553	366	182	(498)	736
Investment Income	511	517	518	386	254
Regular Claims	188	188	188	1,875	2,250
Catastrophe Claims	0	0	0	9,375	0
R/I Recoveries	0	0	0	1,950	0
Net Claims	188	188	188	9,300	2,250
Expenses	75	83	90	98	105
Net Profit	802	613	423	(9,510)	(1,365)
Dividend Payable	188	188	188	188	188
Reserves B.O.Y.	10,000	10,213	10,333	10,356	5,414
Reserves E.O.Y.	10,213	10,333	10,356	5,414	4,544

	Scenario 4 Most Likely				
Gross Premiums	750	563	450	488	563
R/I Premiums Payable					
50-500M Non Cancellable	38	37	34	34	34
500-1000M Cancellable	9	9	9	9	9
Securitisation 1-2B	150	150	150	150	150
Total R/I Cost	197	196	193	193	193
Net Premiums Written	553	366	257	294	369
Investment Income	511	515	512	508	502
Regular Claims	188	375	450	563	675
Catastrophe Claims	0	0	0	0	0
R/I Recoveries	0	0	0	0	0
Net Claims	188	375	450	563	675
Expenses	75	83	90	98	105
Net Profit	802	424	229	142	92
Dividend Payable	188	188	188	188	188
Reserves B.O.Y.	10,000	10,213	10,238	10,165	10,048
Reserves E.O.Y.	10,213	10,238	10,165	10,048	9,907

	Scenario 5 Optimistic				
Gross Premiums	750	563	375	375	450
R/I Premiums Payable					
50-500M Non Cancellable	38	37	34	34	18
500-1000M Cancellable	9	9	9	94	0
Securitisation 1-2B	150	150	150	150	150
Total R/I Cost	197	196	193	278	168
Net Premiums Written	553	366	182	98	282
Investment Income	511	517	518	518	521
Regular Claims	188	188	188	188	188
Catastrophe Claims	0	0	0	0	0
R/I Recoveries	0	0	0	0	0
Net Claims	188	188	188	188	188
Expenses	75	83	90	98	105
Net Profit	802	613	423	330	510
Dividend Payable	188	188	188	188	188
Reserves B.O.Y.	10,000	10,213	10,333	10,356	10,334
Reserves E.O.Y.	10,213	10,333	10,356	10,334	10,402

	Scenario 6 Pessimistic				
Gross Premiums	750	563	375	375	450
R/I Premiums Payable					
50-500M Non Cancellable	38	37	34	629	614
500-1000M Cancellable	9	9	9	94	0
Securitisation 1-2B	150	150	150	150	150
Total R/I Cost	197	196	193	873	764
Net Premiums Written	553	366	182	(498)	(314)
Investment Income	511	510	497	371	246
Regular Claims	188	750	750	750	750
Catastrophe Claims	0	0	0	9,375	0
R/I Recoveries	0	0	0	1,950	0
Net Claims	188	750	750	8,175	750
Expenses	75	83	90	98	105
Net Profit	802	44	(161)	(8,399)	(923)
Dividend Payable	188	188	188	188	188
Reserves B.O.Y.	10,000	10,213	10,048	9,780	5,393
Reserves E.O.Y.	10,213	10,048	9,780	5,393	4,744

Scenario 7
Major Loss Followed by Poor Conditions and then Another Major Loss

Gross Premiums	750	1,500	1,500	1,500	2,250
R/I Premiums Payable					
50-500M Non Cancellable	38	580	184	184	583
500-1000M Cancellable	9	0	0	94	0
Securitisation 1-2B	150	0	0	0	0
Total R/I Cost	197	580	184	278	583
Net Premiums Written	553	920	1,316	1,222	1,667
Investment Income	419	331	324	195	66
Regular Claims	188	938	1,875	1,875	2,250
Catastrophe Claims	9,375	0	0	9,375	0
R/I Recoveries	1,950	0	0	1,450	0
Net Claims	7,613	938	1,875	9,800	2,250
Expenses	75	83	90	98	105
Net Profit	(6,716)	230	(325)	(8,481)	(622)
Dividend Payable	188	188	188	188	188
Reserves B.O.Y.	10,000	6,454	6,382	6,032	1,604
Reserves E.O.Y.	6,454	6,382	6,032	1,604	1,106

Conclusion

This is an important subject and one where actuaries are likely to be increasingly involved. Because of its importance we believe that actuaries should become familiar with these types of contracts and learn how to manage the financial consequences, as there is likely to be a significant increase in this as companies globalise and cover is provided in more areas for these types of risks. Reserving for these companies is difficult but does require the analytic skills which actuaries bring to the solution of insurance problems.

It requires both a deep understanding of the causation of these events and the political, economic and social situation in the territory concerned as well as research into events which have occurred in the past.

There are many potential fruitful areas of further research including the securitisation question.

We believe that the data and the approaches outlined in this paper do provide a way of handling these risks and undertaking the necessary estimation process to manage them. It is important that the actuary has a clear understanding of political considerations that give rise to the various types of risk. It is also important to sub-divide the risk into the various categories that we have outlined in this paper in order to properly evaluate the risk.

Finally, solutions to these problems assist in maintaining social stability which is not the least contribution actuaries can make in this area.

Bibliography

Police Act 1964 - Brixton Disorder, April 10-12 1981; Report of an Enquiry.

Lord Scarman

Command Paper - CMD842

Report of the National Advisory Commission on Civil Disorder

Published 1968

Unofficially referred to as the - "Turner Commission Report"