Modelling and Simulation
World Cup Simulator

Executive Summary

- Spreadsheet models can help businesses with decision making, but should only be used as one tool from a toolbox of management aids
- Management will use quantitative information, model results, research, the prevalent business environment and experience to determine business decisions
- Static models can be used to provide insight into a number of business options, especially with the use of scenarios and sensitivity analysis
- Managers with more complex business decisions to make that involve multiple dependent variables can use simulation techniques to model the business environment
- Simulation models are complex, but the process of developing the model should help organisations learn about their business drivers, risks and issues just as much as the model itself
- Model suffer from a number of limitations and constraints, which are compounded by flawed algorithms and inputs; therefore it is important to carefully develop models and have experienced overseers
- Models can suffer Garbage In Garbage Out (GIGO) issues, cognitive biases, undetectable or complex correlations and inertia
- This report is accompanied by an Excel based Monte Carlo simulation of the 2010 World Cup
- Only open the Excel workbook entitled Isthmus Partners' World Cup Simulator if received from a trusted source or downloaded from the www.isthmuspartners.ae website within the Publications tab
- A user guide for the Isthmus Partners' World Cup Simulator is provided at the end of this report
- This report provides a brief history of mythical World Cup games: enjoy!
- Please visit the following blog for updates and more background information on the Isthmus Partners' World Cup Simulator and the World Cup

  www.wc2010simulator.blogspot.com

ISTHMUS Partners

April, 2010

www.isthmuspartners.ae

Sukhdev Hansra
Partner
SHansra@IsthmusPartners.ae

Javier Cervino, CFA
Partner
JCervino@IsthmusPartners.ae

Anastasia Kozyraki, CFA
Partner
AKozyraki@IsthmusPartners.ae

Tel: +971 4 312 4908
Fax: +971 4 312 4909
Fairmont Business Centre
PO Box 65736
Dubai, UAE

Contents

1. Introduction

This report provides an introduction to simulation techniques through a fun application

In this report we look at modelling techniques that can be helpful in a number of business applications. It is targeted at anyone who is interested in more complex modelling including private equity and real estate investors.

Simulation is a complex procedure, which requires experience and knowledge, but can be a powerful tool in analysing deals. We begin the report by taking a brief look at Monte Carlo simulation techniques including their history, strengths and weaknesses.

To show case the Monte Carlo simulation method we have produced a simulator which generates probabilities for various teams to win the World Cup. Before looking at the simulator, we take a brief look at the history of the World Cup.

We follow by explaining the theory behind the Isthmus Partners' World Cup Simulator, which is provided with this report. Hopefully it will prove to be a fun application, which we have based a number of important topics on.

Finally we provide a user guide for the Isthmus Partners' World Cup Simulator.

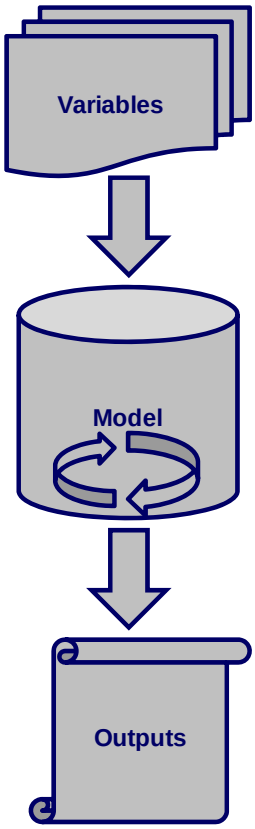
2. Simulation

Spreadsheet models aid business decision making

Businesses prepare spreadsheet models to aid decision making. The range of decisions can be varied including evaluations on whether or not to commence an investment project. If a project is going to be undertaken, a model can help determine how to carry out the project and how it could be optimised. Models can also assist management in assessing the potential impact of changes in the business environment, and help prepare a company to defend itself or take advantage of opportunities presented by such changes.

Variables are modelled to produce outputs

Classic Model Topology



The model building process should foster organisational learning

As depicted above, relevant data is selected and fed into the model as inputs or variables, where they are manipulated through calculations and algorithms to produce outputs. This process is only useful if it facilitates business decision making. The benefit of using models is derived not only from the outputs, but also through the process of developing the model with a multi-skilled team. The process should reveal insights into real business drivers, and provide a meaningful way to understand the levers that affect those drivers, and the risks and issues associated with them ultimately fostering organisational learning. Using a specialist to build a 'black box' model will lead to the loss of business insights and learning, which is a terrible waste.

Sensitivity analysis can help determine critical variables

It is standard for a model to run a sensitivity analysis. This analysis shows the impact on outputs of different combinations of inputs. It helps businesses to understand key variables and the types of situations that would lead to poor outcomes or good results. The decision makers cannot influence the external environment or future scenarios, but they can try to understand the impact on their company of different scenarios.

In practice simulation is used to refer to models with dynamic variables

In strict terms and using Philippatos' classic definition of simulation (1973), "simulation is the use of a model to approximate the behaviour of a real-world system within an artificial environment". However, in practice a simple model is just called a "model" and a model with sensitivity analysis is just called "sensitivity analysis". The word simulation is reserved for models that use more dynamic variables such as Monte Carlo simulation and historical simulation.

Monte Carlo simulation employs repeated random number generation

Monte Carlo simulation is a method by which a model is repeatedly used to produce an output for given inputs. If we call each time the model is used a 'Run' of the model, in each Run the model uses a random number generator to "select" the value for each of the model's inputs. The random number is used to select a relevant value for the input using a distribution that represents the universe of valid values. The Runs generate many outputs, from which a distribution of outputs can be formed.

Historical simulation uses historical paths

In historical simulation the values of the variables (or the changes in the values of the variables) repeat historical paths. In this case, the user needs access to sufficient historical data to make the analysis useful.

The author Hertz, in an article published in the Harvard Business Review in 1964, suggested the use of Monte Carlo simulations for business decisions. This triggered a wave of enthusiasm for application of the technique, which was dampened in the 1970's when limitations of the approach were revealed.

Limitations of models include GIGO, cognitive biases, issues with complex correlations between the variables, and inertia

The limitations of models in general are also applicable to Monte Carlo simulation, and include the following:

- **GIGO:** Garbage In, Garbage Out. If the model has been prepared hastily, or the "right answer" of the model has been "guided" a priori, if all the relevant material variables have not been included, if the interaction of the variables has been poorly or incompletely modelled, then the outputs would not effectively help decision making and the preparation of the model would not support organisational learning.
- **Cognitive biases:** We draw upon selected biases from the field of behavioural finance as detailed by Barberis and Thaler (Advances in Behavioral Finance, Volume II, 2005):
  - Overconfidence: Decision makers are overconfident in their judgments, in both their assessment of confidence intervals (too narrow) and their poor calibration when estimating probabilities.
  - Sample size neglect: Decision makers tend to infer too quickly on the basis of too few data points.
  - Belief perseverance: When decision makers have formed an opinion, they cling to it too tightly and for too long. People are reluctant to search for evidence contrary to their beliefs. And

when such evidence is presented, they treat it with excessive skepticism.

  - Anchoring: When forming estimates, people often start with some initial, arbitrary value, and then adjust away from it.
  - Availability biases: When judging the probability of an event, people often search their memories for relevant information.

- **Correlation between variables:** Nawrocki (Journal of Financial Planning, Nov 2001) details the insufficiency of Monte Carlo simulation when modelling the correlation between inputs. In practice many users of Monte Carlo simulation assume no correlation between variables, which leads to the wrong conclusions and decisions. The types of correlations include:

  - Serial correlation: The future behaviour or path of a variable is correlated with past behaviour.
  - Cross correlation: Different variables are correlated with each other.
  - Cross-serial correlation: Different variables exhibit lagged correlation (what happens today with one variable influences the behaviour of another variable in the future).

- **Inertia:** A model may assume too much serial correlation due to relationships with historic data, which is not representative of potential future scenarios.

Decision makers need to deal with cognitive biases, the correlation problem and inertia

Even if decision makers avoid GIGO and the process of model building is carefully managed, cognitive biases, correlation problems and inertia can still negatively impact the utility of a model. The best way to deal with cognitive biases is to be aware of these biases and to try to consciously avoid them. Particularly, the avoidance of “Group Think” is important, where the opinion and suggestions of outsiders are carefully considered (challenging belief perseverance). The problem with correlations is very complex. One way to deal with this problem as detailed by Nawrocki is the use of historical simulation, since historical data captures the varied correlation behaviour between variables. However, there can be practical limitations in access to historical data or the data sample may be too small. To combat inertia, models should incorporate ‘shocks’, which would replicate the impact of recessions for instance.

Successful managers will try to avoid blind reliance on models, as decision making is an art

Finally, businesses should avoid “model reliance”. This is related to the “anchoring” cognitive bias formed by the numbing comfort provided by a sophisticated model. Decision makers can argue in the future “...but the model said so”. The important thing to remember about models is that they are a tool for decision making, but not the decision makers by themselves.

Models are a tool and the building of a tool should provide learning opportunities

Successful implementation will ensure that models are used as a tool for decision making and that the modelling process fosters organisational learning. When using properly created simulation models with the optimisation software packages that are available in the market, some very powerful insights and guidance for decision making can be obtained.

3. World Cup History

Television's impact on football and the World Cup has been incredible

In the 1920's, FIFA President Jules Rimet was the driving force behind the organisation of the FIFA World Cup as an international professional tournament separate from the Olympic football event. It is doubtful that Mr. Rimet could have anticipated the impact on his beloved tournament that two technologies developed in the future would have: television (first black and white, then colour) and long-distance broadcasting.

The Wold Cup is the biggest single-sport event in the world

The confluence of the popularity of football, broadcasting and national passions have made the World Cup the biggest single-sport event in the world. For many, it is bigger than the Olympics. For people who grew up in the television age, their childhood memories are etched with the thrills and disappointments of this ritual held every four years.

FIFA World Cup Tournaments

Year	Venue	Winner	Runner-up
1930	Uruguay	Uruguay	Argentina
1934	Italy	Italy	Czechoslovakia
1938	France	Italy	Hungary
1950	Brazil	Uruguay	Brazil
1954	Switzerland	W. Germany	Hungary
1958	Sweden	Brazil	Sweden
1962	Chile	Brazil	Czechoslovakia
1966	England	England	W. Germany
1970	Mexico	Brazil	Italy
1974	W. Germany	W. Germany	Netherlands
1978	Argentina	Argentina	Netherlands
1982	Spain	Italy	W. Germany
1986	Mexico	Argentina	W. Germany
1990	Italy	W. Germany	Argentina
1994	USA	Brazil	Italy
1998	France	France	Brazil
2002	Japan/S. Korea	Brazil	Germany
2006	Germany	Italy	France

Eighteen tournaments have been played to date

The current 32-team format started in 1998

The first World Cup was held in Uruguay, which had the strongest team of the 1920's. Thirteen teams participated and the host nation won. Two more World Cups were held in Europe before WWII interrupted the competition. From the 1950 Brazil World Cup, the tournament has been held every four years. From 1934 to 1978, sixteen teams participated in each tournament (although only 15 played in 1938 due to the Anschluss of Austria by Germany and 13 in 1950 due to no-shows). In 1982 the tournament format was changed to 24 teams and continued in that format until 1994. From 1998 the World Cup has been played in a 32-team

format, which is the format for the 2010 South Africa World Cup.

Upsets keeps football unpredictable and thrilling

One of the thrills of football and the World Cup are the upsets where the underdog defeats the theoretically superior team. This unpredictability keeps viewers enthralled because you never know if the game you are watching might be one of those historical upsets. Examples of some of the upsets include the following:

Selected World Cup Upsets

Year	Result	Comment
1950	USA 1, England 0	The English thought the newspaper headlines had a printing error
1950	Brazil 1, Uruguay 2	Host nation was shocked beyond belief
1954	Hungary 2, W. Germany 3	Hungary was the strong favourite in the final
1966	Italy 0, Korea DPR 1	Can the North Koreans repeat in 2010 their 1966 surprise?
1974	W. Germany 0, E. Germany 1	West Germany still won the World Cup
1982	W. Germany 1, Algeria 2	West Germany still progressed to final
1982	Spain 0, N. Ireland 1	Host nation shocker
1982	Brazil 2, Italy 3	The belief that Brazil would win the World Cup before this second round upset was unshakeable
1990	Argentina 0, Cameroon 1	Winner's curse; Argentina still progressed to final
2002	France 0, Senegal 1	Winner's curse again

Some games acquire mythical status

Some games played in the World Cup acquire a mythical status. These games are talked and talked about, with fathers handing down their recollection of these games to their sons as part of a collective memory. We have selected four games that we believe represent best this mythical status:

- **World Cup 1950: Brazil 1, Uruguay 2:** The famous (infamous for Brazil) *maracanazo*. Arguably the biggest sporting upset in history. This match has acquired mythical status in spite of no live television broadcast. The game was not actually the final, rather the last match of a round robin of four finalists. All Brazil needed to do was tie to win the tournament, and early in the second half Brazil scored first. But two Uruguayan goals upset the host nation's firm belief that they would win. According to Jules Rimet, in the stadium *"the silence was morbid, sometimes too difficult to bear"*.
- **World Cup 1970: Italy 4, W. Germany 3:** In this semi-final match, Italy scored early in the first half. The West Germans tied 1-1 in the last second of ordinary play. In extra time West Germany scored first, followed by two goals by the Italians, followed by an

equaliser by the West Germans. At 3-3, the Italians scored their fourth goal through an uninterrupted passing movement straight from the kick-off. Five goals in extra time. West German legend Beckenbauer played extra-time with a dislocated shoulder. The Italians even made a movie where the game is played continuously in background for the duration of the film.

- **World Cup 1970: Brazil 4, Italy 1:** The Brazilian team and its offensive play have acquired legendary status. Pele played and scored in his second World Cup final. Brazil's fourth goal scorcher by Carlos Alberto from a pass by Pele is arguably the best goal in a final ever.
- **World Cup 1982: W. Germany 3, France 3:** West Germany won this semi-final game on penalties. At 1-1 by the end of ordinary time the French took a 3-1 advantage in extra-time only to see the West Germans come back and tie. The game is infamous and still polemic due to the West German goalkeeper Schumacher's foul on French player Battiston.
- **World Cup 1986: Argentina 2, England 1:** This high tension quarter-final game between two countries recently at war is not mythical for the quality of play (rather boring for those of us old enough to remember), but for two moments that would forever be etched in a fan's memory: the "Hand of God" and "the Goal of the Century", both played out by legendary Argentine player Maradona. With Maradona returning to the 2010 World Cup as Argentine coach, expect the memories of this game to be rekindled.

Will there be any mythical games in 2010? Time needs to pass for a game to be considered mythical. Perhaps the 2006 semi-final between Germany and Italy or the final between Italy and France may acquire mythical status, but time will tell.

Some teams acquire legendary status, some without winning the World Cup

Some teams also stand out in World Cup history. Examples are Brazil 1958, Brazil 1970, Netherlands 1974, Brazil 1982 and France 1986. It is of note that a team does not need to win the World Cup to be remembered. It is something about the style of play and the charisma of the players that manages to survive the test of time.

4. The Isthmus Partners' World Cup Simulator

Spain wins the World Cup by beating Brazil 1-0 in the final, or Italy wins 2-1 against Germany in the final. Actually, both of these are possible as well as numerous other permutations. This simulator provides a way to model the 2010 World Cup to give probabilities of certain outcomes.

Football is big business

Football is the beautiful game, but it's also big business. According to the UK Daily Telegraph, during World Cup 2006 FIFA generated marketing revenues of EUR 1.9 billion, including EUR 1.08 billion in television rights and EUR 600 million from sponsorships from "Official Partners". On top of the marketing revenues ticket sales were expected to bring in another EUR 200 million. FIFA president Sepp Blatter commented in April 2010 that contracts signed to date for the 2010 World Cup were 25% higher than the previous World Cup.

Even in football simulation can be required to understand financial risks

A simulation of the World Cup can be thought of as just a trivial exercise. However, consider the Spanish football federation, which pays the highest bonuses to players for winning the World Cup. The bonus for the 2010 World Cup is reputed to be EUR 550,000 per player for winning (twice that for the coach), with smaller amounts for reaching the quarter-finals and semi-finals. Winning the World Cup is a joy, but it also brings with it a big payout. The Spanish football federation is known for having insured this payout risk with insurers in past tournaments. For the specialist insurers and reinsurers which estimate the premium for this insurance contract, a simulation could give them an idea of the probability of payout and the requisite premium that would cover their risk.

For a television company competitively negotiating a bid to win broadcasting rights within its own market, an impassioned assessment of the national team's chances in the World Cup will provide guidance on how likely the team is to progress, which will have an impact on ratings and advertising revenue, and therefore the profitability of the bid.

General Process

The number of combinations of results for the World Cup is mind boggling

If we look at the possible combination of results in the first round, we can find that there are six games, each with three potential results: win for team A, draw and win for team B. That leads to 3^6 potential combinations or 729 combinations. Because there are eight groups, there are 729^8 combinations across all the groups or 79 billion trillion result combinations! Overlay that with the potential scores, and this number becomes much, much bigger.

For each group there are 12 potential combinations of teams finishing 1st or 2nd. As there are eight groups, that leads to 430 million (12^8) combinations of round of 16 games. This means that the 79 billion trillion combination of first round results filters into 430 million combinations of first round teams that make it to the knockout stages.

From the round of 16 to the final there are 32,764 (2^{15}) different combinations. Combining this with the 430 million potential combinations of round of 16 teams there are 14.1 trillion possible permutations in the knockout stages to find a winner of the World Cup.

All these combinations are not equally weighted. For instance, is it as

Probabilities limit the realistic number of combinations

likely for Argentina to beat Ghana, as it is for USA to beat Ghana? No! We have to look at probabilities of each game to work out which paths are most likely.

We have used Monte Carlo simulation to model this non trivial problem

We have used a Monte Carlo simulation to run simulated World Cups to create various permutations of results from the group stages to the ultimate winners. The model can simulate the whole tournament, or certain scores can be entered and the model can be used to simulate the rest.

The model works through each round in turn

The model works through simulating every game the user has not provided an input for. Each simulated game uses a head to head distribution to predict the score, which is described below.

The simulator passes each round in turn, and takes into account previous results to indicate the winner. Therefore, the model is 'path specific', i.e. if a team is eliminated in the first round, it is not possible for that team to compete in subsequent rounds.

The user can input actual scores or predicted scores before running the simulation

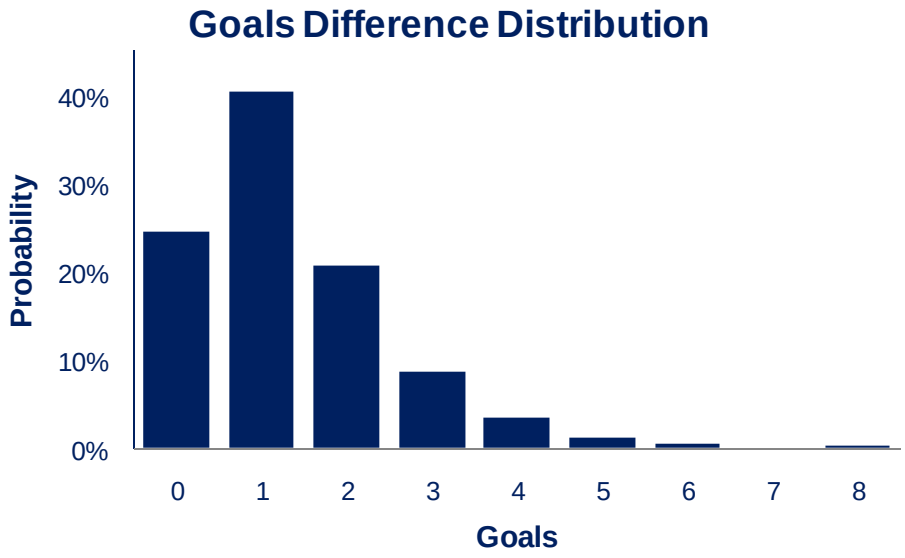
The user provides an input for the number of iterations to run. Each iteration runs one simulated World Cup taking into account any scores the user wishes to keep. The more iterations are carried out, the less variability there is in the final result. The probabilities of a team reaching a certain round, or ultimately winning the World Cup are calculated from these simulated 'paths'.

Head to Head Distribution

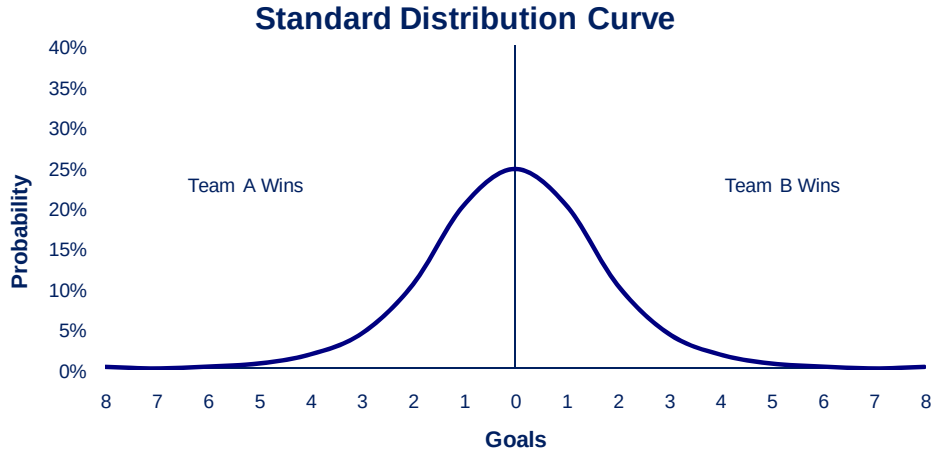
The score between two teams is a three step process. First, we determine the standard distribution of scores between any two teams. We have looked at the last five World Cups, and weighted them as to their relevance. The later World Cups have greater weights than earlier World Cups. The weighting can be changed by the user.

The standard curve is created from the results of the last five World Cups

Over the last five World Cups, the distribution runs from draws to a team winning by eight goals, as depicted in the graph below.



This does not indicate which team wins. Our standard curve creates a distribution whereby one team is expected to win. The graph below shows that teams A and B are equally likely to win and by the same number of goals.



The standard curve is altered by head to head results, the FIFA rankings and user input points

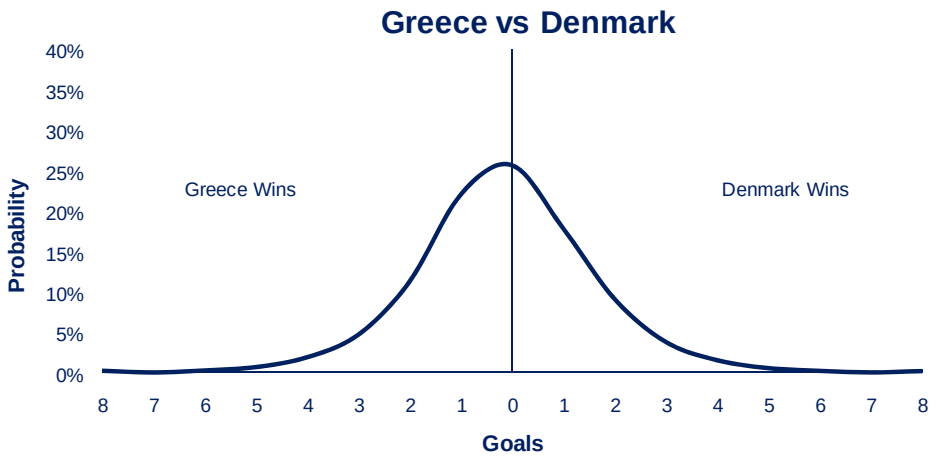
The second stage is to alter the standard curve to show how one team may have an advantage over another team. The model uses two inputs and the user has one further input. The model uses the latest version of the FIFA rankings, which was published on 31st March, 2010 at the time of writing and the head to head records between the two teams concerned. The user can enter a further input, through a distribution of 1,000 points between the 32 competing teams. The weighting between the model and the user can be changed in the setup sheet.

The head to head records are used to determine if the curve should be more or less peaked, i.e. if a draw is more or less likely, than the standard result between two teams. If a draw is less likely, the curve becomes less peaked, and the tails become fatter. If a draw is more likely, the curve becomes more peaked, and the tails become thinner.

The FIFA rankings, head to head records and user inputs are then used to skew the draw-adjusted curve towards the team most likely to win. The team most likely to win has the better head to head record, is higher in the FIFA rankings and has more user input points. The three inputs could work against each other when creating an aggregate effect.

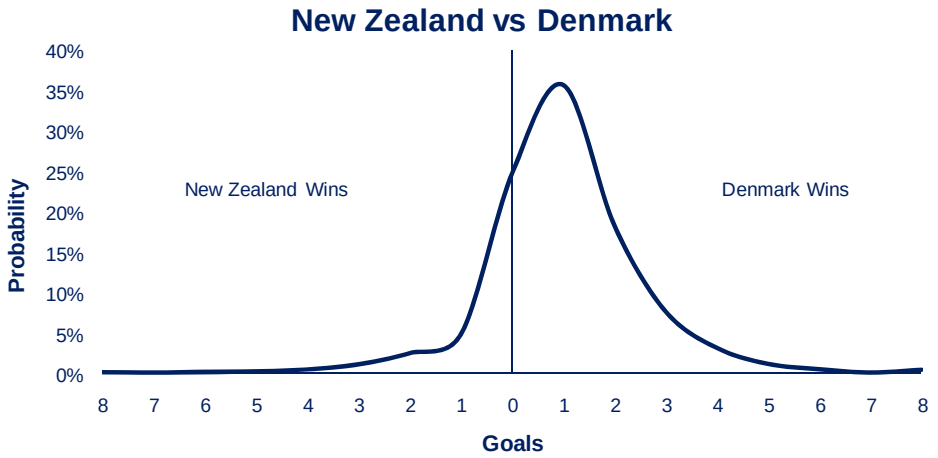
To provide an insight into the curve adjustments, we will use Denmark as an example, using a weight of 100% for the model, i.e. no user input. Against Greece, the standard curve is changed in only a minor way. The graph below shows a slightly higher probability of Greece winning than Denmark winning. However, a draw has the highest probability.

Greece vs Denmark is close to the standard curve



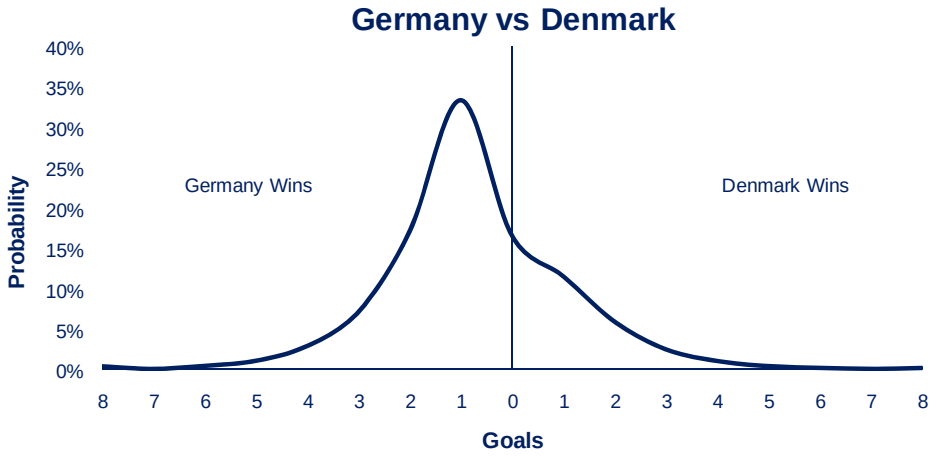
Against New Zealand, the distribution below shows a marked likelihood that Denmark will win. In fact, the model results indicate that Denmark is more likely to win by one, two or three goals, than New Zealand winning by one goal.

Denmark are likely to beat New Zealand



Against Germany, the distribution below shows Germany has a greater likelihood of winning. However, the probability of Denmark beating Germany is greater than that of New Zealand beating Denmark.

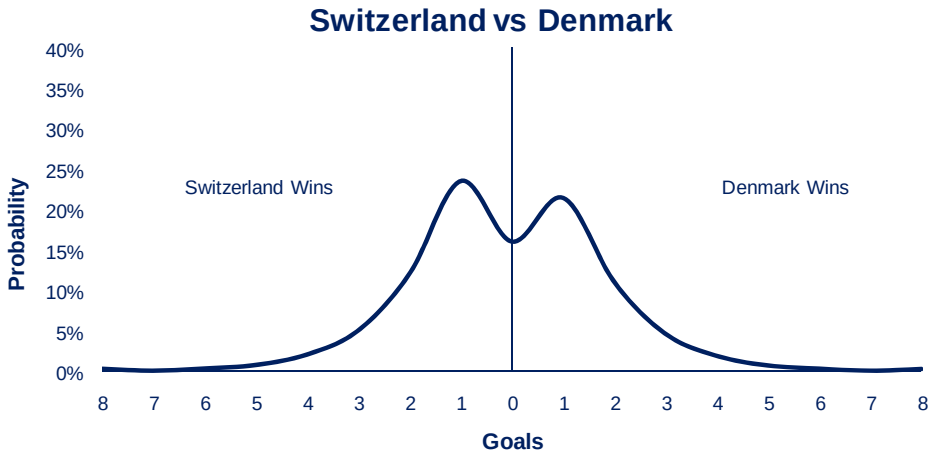
Germany is likely to beat Germany



Finally we look at Switzerland versus Denmark. In this case, the

distribution below shows that both Denmark and Switzerland are more likely to win by a single goal than draw against each other. Switzerland has the slightly higher probability of winning.

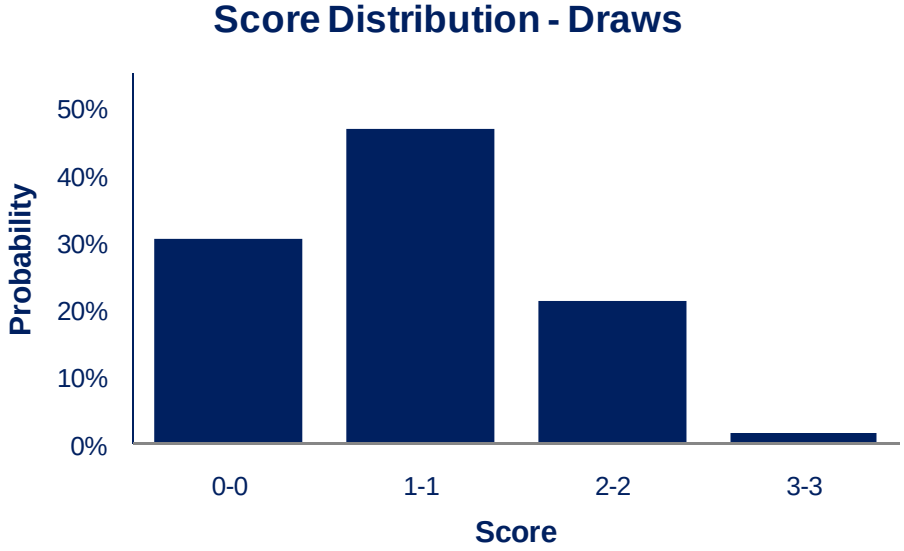
Switzerland and Denmark are unlikely to draw



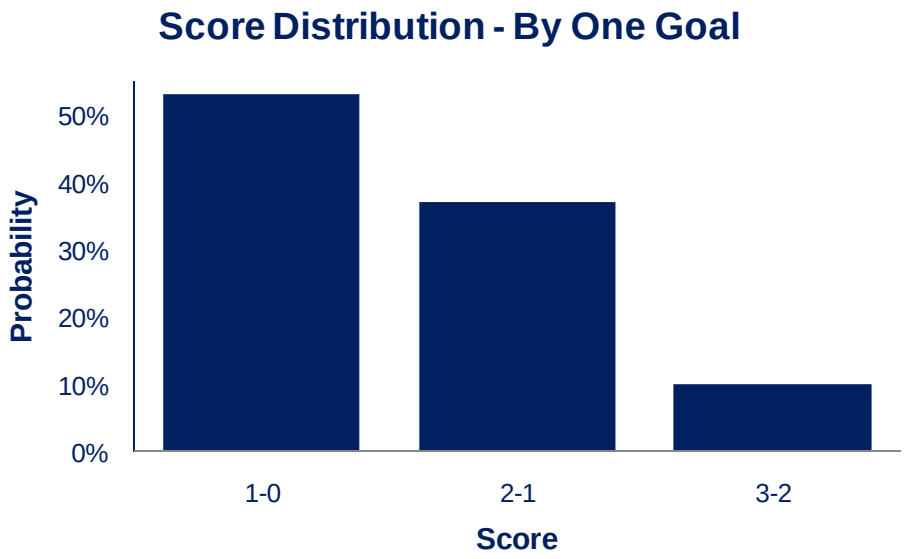
We have not serially correlated any results, i.e. we have not assumed that a team in any one World Cup simulation is more likely to win because they have been winning previously. Therefore we have not tried to model the form of teams throughout the tournament.

The actual scores are calculated from a distribution of scores determined by the last five World Cups

The third and final stage is to take the goal difference between the two teams and create an actual score. Here we go back to the last five World Cups and determine the most likely score given the goal difference. The past World Cups are weighted as previously. For instance, if the game resulted in a draw, the most likely score would be 1-1, as shown in the graph below.



However, if the goal difference is one goal the most likely score is 1-0, as shown below.



This score is important, as the group stages could be determined by goal difference or by the number of goals scored. In the knockout stages, a draw will result in a penalty shootout, the winner of which is determined randomly.

Model Limitations

This model is not an accurate predictor of the World Cup; it only show cases the simulation technology

By creating this model, we do not profess to predict the outcome of the World Cup. The model provides a view into the world of simulation in a fun way, but has a number of deficiencies, which could be resolved through better specified inputs, a greater number of inputs, and a treatment for inertia. Of course the World Cup has a number of 'wild card' events that the model cannot know such as injuries, players being sent off, poor referee decisions, etc. This all adds to the excitement of the World Cup, but also makes it extremely difficult to model outcomes.

A better specified model may look at individual scores between teams. We have looked at the general record, but countries have played each other surprisingly few times. Therefore, more information may be sought by looking at the actual scores between teams, as opposed to the number of total wins, draws and losses.

The head to head record may also create some inertia. We have not weighted the results by time. Therefore, a score from 90 years ago has the same relevance in the model as a result one year ago. If team A beat team B consistently until 1990, but then lost every game since, the inertia of results prior to 1990 will potentially skew the results incorrectly.

More inputs could help on penalty shootout decisions. We could capture information about head to head penalty shootouts or penalty shootouts generally to determine probable winners. We have not looked at this data, but we suspect the data would be too sparse to model with.

Many of the deficiencies we have discussed above relate to information. Information in a Monte Carlo simulation is extremely important; therefore much of simulation process involves sourcing, cleaning and testing data.

It is also important to understand which data to look at. We could rate every player that will play for every team. Squads have not been

announced at the time of writing, but every member of a squad could potentially have an effect on a game. However, with all this data specified, ratings would be subjective, and injuries and form are unlikely to be modelled well. Therefore, though more data can be collated, it does not guarantee more accurate forecasts.

Insights

The model has produced some interesting insights

Though the model has a number of limitations, a number of interesting insights can be drawn. For instance, France has an approximately equal or higher probability of reaching the second round, but a lower probability of winning than Germany or the Netherlands. This is most likely due to Germany and the Netherlands being in harder groups than France, but in head to head games they are more likely to win.

The model also provides the ability to analyse simulated results to determine the probability of two teams meeting within or by a certain round in the knockout stages. Additionally, users can model the likely score and result between two teams.

5. User Guide

Distributions

Press 'Run Distributions' to run all head to head distributions

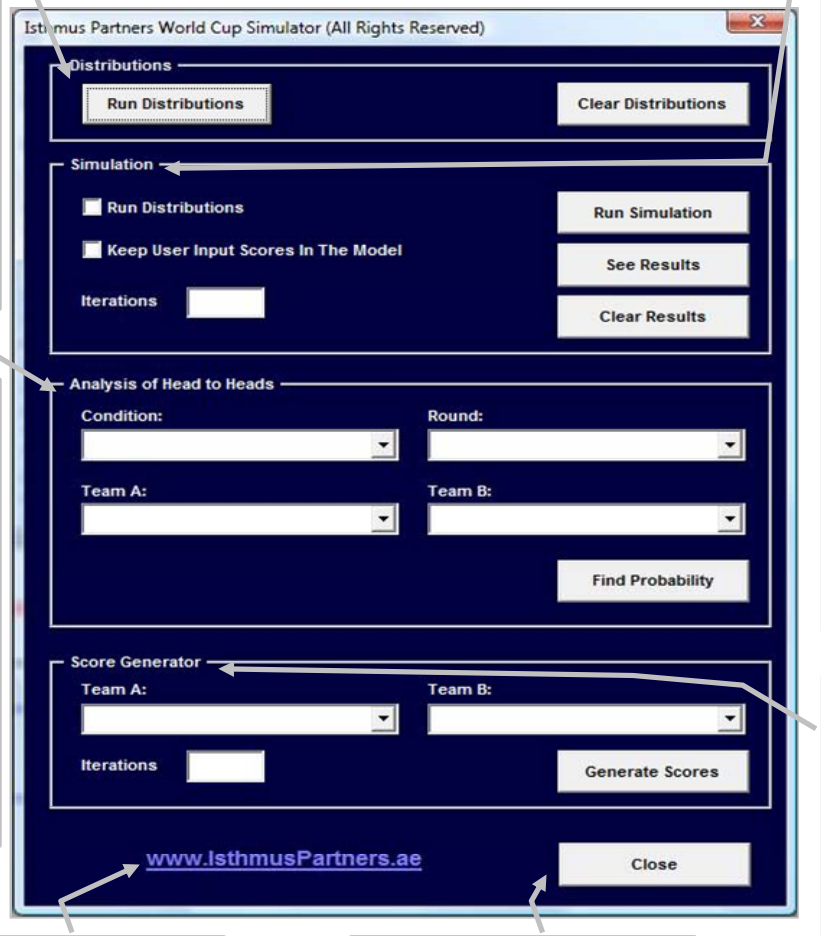
Press 'Clear Distributions' to clear current stored distributions (do so before distributing workbook to reduce file size)

Analysis of Heads to Heads

Run Simulation first

(1) Choose in 'Condition' to "meet by" or "meet in"
(2) Choose Round where to meet by or in
(3) Choose Team A & Team B
(4) Press 'Find Probability' button

You will see the probability of the head to head event within the current stored simulation



Simulation

Check 'Run Distributions' if you have not run distributions yet or you have new assumptions

Check 'Keep User Input Scores in the Model' if you inputted scores in the model which you wish to keep and you do not want the simulation to disregard the scores

'Iterations' input between 500 – 9999

Press 'Run Simulation' to generate simulation with current distributions

Press 'See Results' to see distribution of probabilities

Press 'Clear Results' to erase results (do so before distributing workbook to reduce file size)

Score Generator

(1) Choose Team A & Team B
(2) Choose number of iterations (500 – 9999)
(3) Press 'Generate Scores' button

You will see the distribution of scores and results between both teams

Click on link to access Isthmus Partners website

Click 'Close' button to close window

The user guide will help with the basic operation of the model

Only open the Excel workbook entitled Isthmus Partners' World Cup Simulator if received from a trusted source or downloaded from the www.isthmuspartners.ae website within the Publications tab.

In Office 2007, open the Excel workbook and accept "enable this content" when prompted by Excel; this will activate the macros embedded in the workbook. In earlier versions, open Excel and click on "Enable Macros".

In the 'Setup' worksheet you can control the weighting between the distributions that are originally assumed by the model.

Make sure "User Team Weightings" sum up to 1000, the user controls the weightings in the highlighted range (no decimals).

In worksheets 'Group Stages' and 'Knockout Rounds' you can input results and the model will calculate group rankings (press 'Update Tables' button in worksheet 'Group Stages') and show the path throughout the knockout rounds to the final.

In worksheet 'Setup', press the 'Run Simulator' button to bring up Simulator Dialog Box; see previous page to navigate the Simulator Dialog Box.

Pressing the 'See Results' button in the Simulator Dialog Box will take you to the 'Probabilities' worksheet where you can see the probabilities of each team to reach certain stages within the simulation that is currently stored within the workbook.

In order to run simulations entirely under your own assumptions, change the "Model" percentage in worksheet 'Setup' to 0% (that will automatically make User Input 100%).

Play around with the Score Generator function within the Simulator Dialog Box to get the right "feel" for head to head distributions resulting from the inputted User Team Weightings. Each time you change the weights run the distributions again to ensure all the distributions reflect the new weights. As a rough rule of thumb each time you double the ratio between two teams the chances of the weaker team winning are cut in half.

If the World Cup has started and you are updating the results in the workbook and/or you want to run the simulation with results that you input, then check the 'Keep User Input Scores in the Model' checkbox in the Simulator Dialog Box and the simulations will keep your scores in place (otherwise they will be disregarded in the simulation). All the results for prior rounds must be provided if the model is to keep the next round of user input results, e.g. if you have entered any scores for the round of 16 knockout stage, they will only be picked up if all of round one group stage results are provided.

About Isthmus Partners

Isthmus Partners is a UAE based consultancy that offers consultancy advice on SME private equity and real estate assets. It was founded and is owned by three partners with a wealth of principal finance and structuring experience from 25+ years in investment banking and management consulting.

In the real estate sector, Isthmus Partners advises on and structures deals in the late stage development segment. The partners have worked on restructuring a number of real estate deals in Dubai including The World, Sports City, The Marina, and The Waterfront.

In the SME private equity sector, Isthmus Partners focuses on new ventures, expansion capital and buyouts. The partners have worked on a number of new venture proposals based on product and materials manufacturing across the GCC, tourism and software. They have also worked on expansion financing and buyouts for an interior design firm and in the alternative energy sector.

Isthmus Partners' services include investment project health checks through financial due diligence, feasibility studies, monitoring of ongoing projects to ensure greater control through cash flow monitoring models, and advice on sources of financing.

For more information and to find more of our available reports please visit our website, www.isthmuspartners.ae.

Important Disclosures and Disclaimer

This research report has been prepared by Isthmus Partners FZC, a limited liability company ("Isthmus Partners") and provides general information only. Neither the information nor any opinion expressed constitutes an offer or an invitation to make an offer, to buy or sell any assets, securities or other financial instrument or any derivative related to such securities or instruments (e.g., options, futures, warrants, and contracts for differences). This report is not intended to provide personal investment advice and it does not take into account the specific investment objectives, financial situation and the particular needs of any specific person. Investors should seek financial advice regarding the appropriateness of investing in assets, or financial instruments and implementing investment strategies discussed or recommended in this report and should understand that statements regarding future prospects may not be realized. Any decision to purchase or subscribe for assets or securities in any offering must be based solely on existing public information on such assets or security or the information in the prospectus or other offering document issued in connection with such offering, and not on this report.

Certain outstanding reports may contain discussions and/or investment opinions relating to assets, securities, financial instruments and/or issuers that are no longer current. Always refer to the most recent research report relating to a company or issuer prior to making an investment decision.

We are providing the Information to you for information purposes only and without representation or warranty, express or implied, by us as to its accuracy or completeness and without any responsibility on our part to revise or update the Information. As a condition for providing this information, we make no representation and shall have no liability in any way arising therefrom to you or any other entity (for any loss or damage, direct or indirect, arising from the use of this Information).

Except where otherwise indicated herein, the Information provided herein is based on matters as they exist as of the date of preparation and not as of any future date and will not be updated or otherwise revised to reflect information that subsequently becomes available or circumstances existing or changes occurring after the date hereof.

Nothing contained herein should be construed as legal, investment, accounting or tax advice. Each prospective investor, client or partner should consult its own attorney, business or investment advised, accounting adviser and tax adviser as to legal, business, accounting, tax and related matters concerning the information contained herein. Prospective investors, clients or partners should make their own analysis and decisions of the information contained herein, independently and without reliance on the Information or on us and based upon such investigation, analysis and evaluations, as they deem appropriate.

In no event will Isthmus Partners be liable for any loss or damage including without limitation, indirect or consequential loss or damage, or any loss or damage whatsoever arising from loss of data or profits arising out of, or in connection with, the use of the Isthmus Partners' World Cup Simulator.

Isthmus Partners does in no way take responsibility for any viruses, or technical issues caused by Isthmus Partners' World Cup Simulator, whether the model was received directly from Isthmus Partners, a third party or downloaded from the Isthmus Partners website. The user is expected to take due precaution over opening files that may contain viruses.