Olympics Bid
London 2012

Probability assessment for the
Department of Culture, Media and Sport

13 January 2003

PricewaterhouseCoopers

Contents

Background

- PwC has been commissioned by the DCMS to provide a subjective, probabilistic assessment of the risks and uncertainties involved in a bid to hold the Olympics in London in 2012.
- This process has involved:
  - Debate on key uncertainties;
  - Quantification of probabilistic distribution of key uncertainties drawing on expert judgement.

Contents

We have identified a subset of variables that are key to the decision to bid

Cost variables

- Land acquisition
- Construction / infrastructure
- ICT
- Elite sports programme
- Security
- Look of London
- Transport
- Administration
- Venue rental

Land acquisition → Bidding

Construction / infrastructure, ICT, Elite sports programme → Pre-event

Security, Look of London, Transport, Administration, Venue rental → Staging

Revenue variables

- TV revenues
- Ticket sales
- Sponsorship
- Legacy value

TV revenues, Ticket sales, Sponsorship → Pre-event and staging

Legacy value → Post-event

Decision variable:

We have selected the public subsidy as the output of interest.

Contents

- Introduction
- Summary of key variables
- Probability assessment
- Results and analysis

Bidding cost: Land acquisition

- This is the total cost attributable to the Olympics of acquiring new land on which facilities for the Games can be built.

	Low (10%)	Nominal (50%)	High (90%)
Value	375	425	500

Notes / Assumptions

- Nominal case = Arup estimate (£375m, spring 2002) + £50m due to price appreciation to January 2003.
- The high estimate incorporates the risk of price speculation:
  - if the CPO process is not started early after an announcement to bid, or
  - for those sites not included in the main Order that will be required at a later date.

Pre-event cost: Construction and Infrastructure

- This is the total cost attributable to the Olympics of construction and infrastructure of venues for the Games, splitting out training venue upgrades.

	Low (10%)	Nominal (50%)	High (90%)
Construction and infrastructure, excl. training venue upgrades	609	731	1000
Training venue upgrades	10	20	100

Notes / Assumptions

- All estimates assume the Olympic village will be developed by the private sector and leased to LOCOG during the staging phase.
- Nominal case (excl. upgrades) = Arup estimate inclusive of contingencies.
- High cases include:
  - Extra costs arising through scope creep and pressure to increase legacy value, e.g. by building permanent rather than temporary structures.
  - Uncertainty around Sport England estimates - may need to finance a 50m pool.
  - Uncertainty around design requirements, e.g. height of roofs.

Pre-event cost: Information and Communication Technology

- This is the total cost attributable to the Olympics of ensuring that adequate IT, communications and broadcasting infrastructure is in place to support the Games.

	Low (10%)	Nominal (50%)	High (90%)
TV signal	50	67	100
Other IT / comms	115	170	280

Notes / Assumptions

- High case (both categories) = Arup estimate.
- Nominal case (TV signal) = Sydney cost.
- Low case (other IT/comms) = San Francisco cost.
- New Olympic Broadcasting Committee (OBC) to be set up which may bring TV costs down in the future by increasing competition.
- At least £174m may be mandated by IOC for tech / comms (rumour).
- The UK is an established ICT market, thus offering considerable cost savings compared to Sydney.

;

Pre-event cost: Elite Sports Programme

- This is the total cost attributable to the Olympics of initiating and maintaining an elite sports programme to boost performance at the Games.

	Low (10%)	Nominal (50%)	High (90%)
Value	0	100	250

Notes / Assumptions

- High case = Arup estimate, benchmarked against Sydney costs.
- Range influenced by factors such as:
  - public pressure to guarantee a successful Games for the host nation;
  - extent of Lottery funding that may be diverted to this programme;
  - uncertainty about how much of this cost would be attributable to the London Olympics rather than general preparation for an Olympics.
- Such a programme will generate wider economic benefits that are not considered in this evaluation of Exchequer costs and benefits.

Staging cost: Security – Range estimation

- This is the total cost attributable to setting up and operating an Operational Command Unit prior to the Games and providing security during the Games, including at venues.

	Low (10%)	Nominal (50%)	High (90%)
Value	100	170	280

Staging cost: Security – Notes and assumptions

- Arup estimate (£160m) derived from:
  - £30m for operating costs (benchmarked as 150% of Sydney costs, split £25/5m in London/outside);
  - £130m for the Met OCU (4 year programme).
  - Doubts exist about the scope and timing of OCU.
- Nominal estimate (£170m) derived from:
  - £30m for venue security;
  - £100m actual spend in 2012 (Lord Faulkner's estimate);
  - £40m for planning prior to 2012.
- High estimate (£280m) derived by raising the nominal figure as follows:
  - £50m for venue security;
  - £100m actual spend in 2012 (Lord Faulkner's estimate);
  - £130m for planning prior to 2012.

Staging cost: Look of London

- This is the total cost attributable to the Olympics of improving the “Look of London” for the staging of the Games.

	Low (10%)	Nominal (50%)	High (90%)
Value	20	40	60

Notes / Assumptions

- Benchmarked against Manchester costs (£5m), accounting for:
  - 4-8 times multiple for London;
  - London has two times as many venues as Manchester.

Staging cost: Administration

- This is the total cost of administration for staging the Games.

	Low (10%)	Nominal (50%)	High (90%)
Value	298	450	550

Notes / Assumptions

- High level of uncertainty noted in this area, especially salary / resourcing:
  - Consensus that Arup salary estimates are around 50% too low;
  - Staffing numbers in year of staging may also be too low: benchmarking against past Games may exclude hidden costs due to organisational structure (e.g. utilisation of staff from local government).
- Low case = Arup estimate.
- Nominal case adds corrections for salary levels.
- High case adds further corrections for staffing levels.

Staging cost: Venue rental

- This is the total cost of venue rental for staging the Games.

	Low (10%)	Nominal (50%)	High (90%)
Value	47	67	87

Notes / Assumptions

- Nominal case = Arup estimate
  - Based on actual quotes received from venues (e.g. ExCel), or
  - 15% of ticket revenues, as estimated from a quote for football ground rental.

Transport: Range estimation

- Transport is a complex cost with implications at various stages:
  - Pre-event: infrastructure costs, e.g. of upgrading existing infrastructure (excluding Crossrail);
  - Pre-event and staging: cost of setting up and operating an Olympic Transport Agency for traffic management for the Games.

	Low (10%)	Nominal (50%)	High (90%)
Capital expenditure	100	200	300
Operating expenditure	100	143	200

Transport:
Notes and assumptions

- The transport range estimates derive from consultations arranged by the Government Office for London (GoL) as listed below:
  - Opex: £23.4m [Arup report], £20m-£50m [LU], £4m-£5m [DLR], £30m [SRA – net of revenue], £8m [TfL - for traffic mgt], £5m [Highways Agency], £2m [City airport], £20m [publicity planning]. The nominal case assumes the maximum of these estimates.
  - Capex: £100m-£200m [Stratford upgrade – Arup dispute this estimate], £10m-£20m [Bromley-by-Bow upgrade], £25m [Park & Ride], £15m [DLR]. The nominal case assumes £150m [Stratford] and £10m [B-by-B].
- Scheduling is controllable but background demand must be suppressed.
- Capex is largely attributable to the Olympics as there is no obvious reason why it would otherwise be undertaken.
- Legacy benefit has not been taken into account.
- Possible displacement of alternative transportation schemes.

Television Revenues: Range estimation

- This is the total revenue from TV rights for the Games, both in advance of and during the staging of the Games.

	Low (10%)	Nominal (50%)	High (90%)
Value	350	534	700

Television Revenues: Notes and assumptions

- Estimates are media rights, but these are largely driven by TV.
- Assume IOC share will remain stable at around 51% (unless values drop or rise substantially in which case it is expected that the IOC will lower or raise its take accordingly).
- Listed events are shown free-to-air - affects competition and limits revenues.
- Timing of bid is unclear – 2005, or later?
- The low case assumes that poor economic conditions prevail when bidding.
- Nominal case = Arup estimate adjusted for current $/£ exchange rate.
- The high case considers that:
  - Valuable new markets (for example China, Eastern Europe) are expected to open up between now and 2012;
  - Compared to Australia, London is well located geographically;
  - UK has an established broadcasting market so purchasers may pay more for confidence in the product.

Ticket Sales Revenues

- This is the total revenue from ticket sales for the Games, driven by the price of the tickets and the number of tickets sold.

	Low (10%)	Nominal (50%)	High (90%)
Value	200	300	464

Notes / Assumptions

- Key issues are median price, seat kill, sales commission and % sold.
- Assume that the Games are sold out in all cases, through price adjustment if necessary.
- High case = Arup estimate because this was felt to be a very optimistic scenario with high median price, low seat kill, low commission and a sell-out Games (although the median prices are comparable to other bids).
- High degree of discomfort with existing pricing due to affordability issues: public willingness-to-pay has not been market tested.

Sponsorship Revenues

- This is the total revenue from TOP and local sponsorship, plus official suppliers, for the Games.

	Low (10%)	Nominal (50%)	High (90%)
TOP sponsors	65	115	140
Local sponsors and official suppliers	100	210	300

Notes / Assumptions

- TOP nominal case = Arup estimate adjusted for current $/£ forex rate.
- Non-TOP nominal case = Arup estimate (£150m local + £60m suppliers).
- Athens has achieved sponsorship targets early.
- TOP sponsors limited to 8, preventing crowding out of local sponsors.
- TOP sponsorship is an established market with existing contracts; hence no significant variability in income is foreseen.
- Cost of looking after local sponsors? (up to a third – not included).
- Benefits of official suppliers queried – excess supply is of limited value.

Legacy Value Revenues

- This is the total revenue derived from legacy uses of Olympic assets (stadia and land).

	Low (10%)	Nominal (50%)	High (90%)
Football stadium	0	30	50
Land	350	500	600

Notes / Assumptions

- Nominal case (land) = Arup estimate + extra £50m for land appreciation consistent with £50m added to nominal land acquisition costs.
- Nominal case (stadium) = Arup guess, comparable to Manchester.
- Timing for revenue recovery (impacting NPV) likely to be delayed relative to Arup assumptions.
- Very likely that land costs will be recovered, as Games development can only increase its (currently very low) value.

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- Introduction
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All subcategories of the variables assessed as key to the Olympics bid are shown below

Cost variables

- Land acquisition — *Bidding*
- Construction / infrastructure — *Pre-event*
- Training venue — *Pre-event*
- Transport CAPEX — *Pre-event*
- Technology & telecom — *Pre-event*
- TV signal production — *Pre-event*
- Elite sports programme — *Pre-event*
- Security — *Staging*
- Look of London — *Staging*
- Transport OPEX — *Staging*
- Administration — *Staging*
- Venue rental — *Staging*

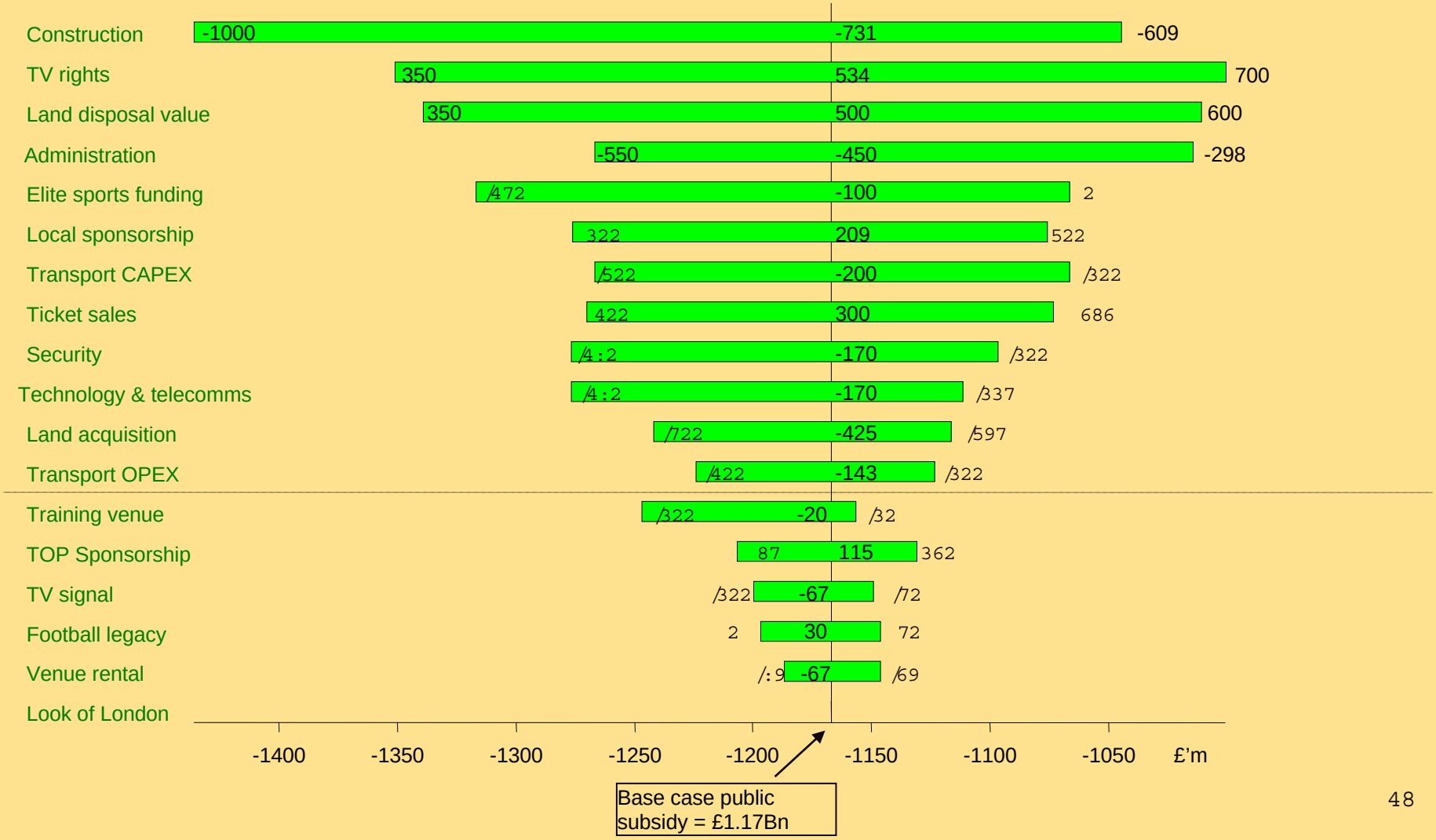
Revenue variables

- TV revenues — *Pre-event and staging*
- Ticket sales — *Pre-event and staging*
- TOP sponsorship — *Pre-event and staging*
- Local sponsorship — *Pre-event and staging*
- Football legacy — *Post-event*
- Land disposal value — *Post-event*

Analysis – Step 1: Sensitivity analysis

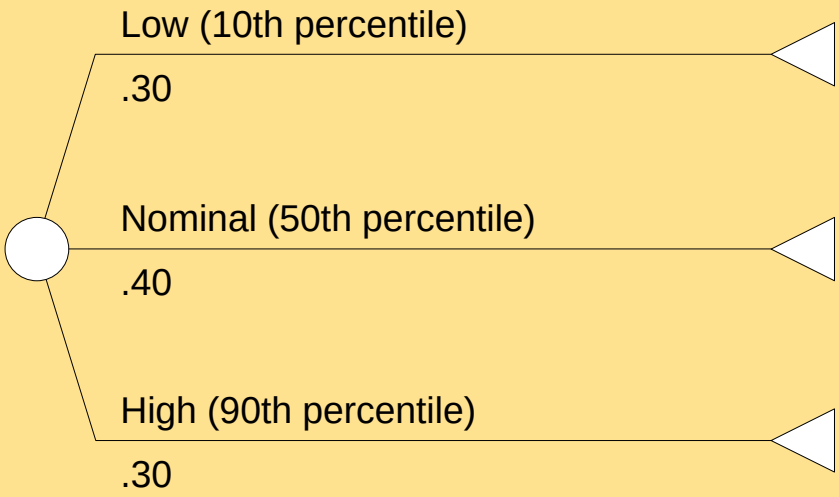
- Set the spreadsheet to the nominal value for all variables
  - This is the base case.
- For each variable X, holding all other variables at their nominal values:
  - Vary the value of X: set X to the low value assessed and run the spreadsheet.
  - Repeat for the high value assessed for X.
  - This provides a sensitivity range for X.

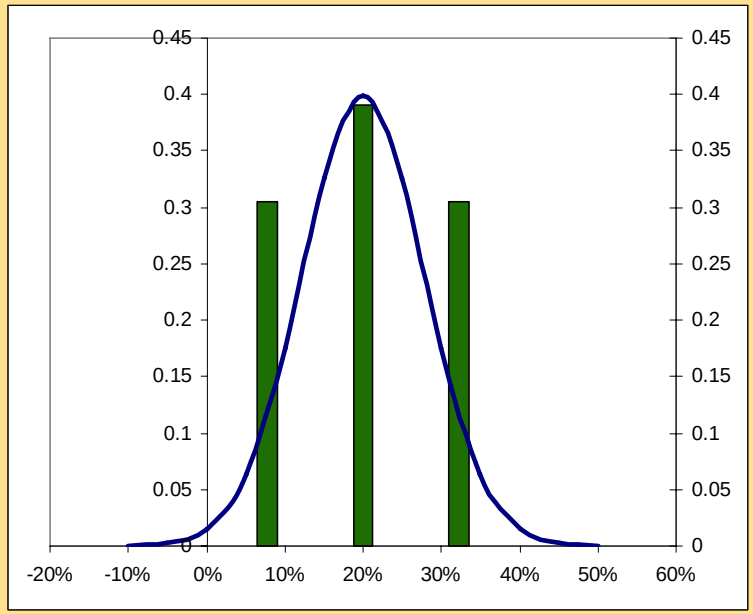
Sensitivity analysis shows the impact of each variable on the public subsidy



Analysis – Step 2: Convert range assessments to probability distributions

- Where the ranges assessed are relatively symmetric, low (10th percentile), nominal (50th percentile), and high (90th percentile) estimates are roughly equivalent to a discrete distribution with 3 states of 30%, 40%, and 30% probability, respectively.



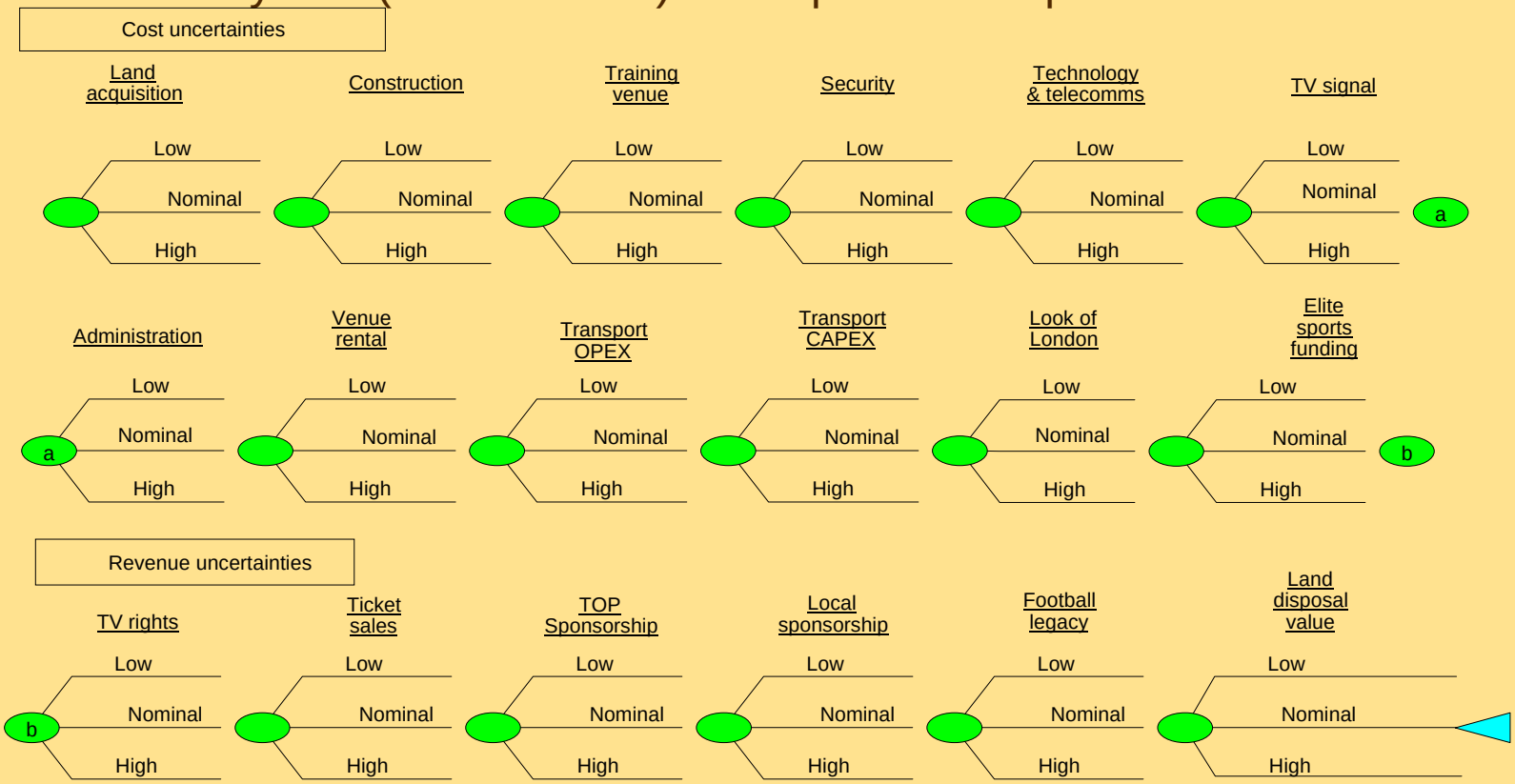


Analysis – Step 2: Convert range assessments to probability distributions (continued)

- While a 30%-40%-30% normal approximation was deemed to be appropriate for most of the variables, some adjustment was made to the more asymmetric variables with a significant impact on the output value (as demonstrated by the sensitivity analysis)
- This adjustment was intended to shift a higher probability to the case furthest from the nominal, while maintaining a 40% nominal probability
- The greater the asymmetry in assessment, the larger the difference imposed between the probabilities assigned to the low and high cases
- 20% - 40% - 40% distribution (low - nominal - high):
  - Construction excluding training upgrades and technology / telecommunications
- 25% - 40% - 35% distribution (low - nominal - high):
  - Security and elite sports programme
- 35% - 40% - 25% distribution (low - nominal - high):
  - Administration and land disposal values

Analysis – Step 3: Risk profile based on probability distributions

- A risk profile is generated by computing all possible paths through an uncertainty tree (shown below) for a specified output variable.



- This generates a profile of the range of output values expected given the range and distribution of uncertainties assessed.

We concentrate on the variables with a large impact on the public subsidy

Cost variables

- Land acquisition
- Construction / infrastructure
- Training venue
- Transport CAPEX
- Technology & telecom
- TV signal production
- Elite sports programme
- Security
- Look of London
- Transport OPEX
- Administration
- Venue rental

Revenue variables

- TV revenues
- Ticket sales
- TOP sponsorship
- Local sponsorship
- Football legacy
- Land disposal value

Variable with less impact

Variable with large impact

The expected public subsidy for the Olympics bid is £1.33Bn; there is an 80% chance that it falls within the range £0.90Bn to £1.77Bn

Variables with less impact are set to their nominal values.

This calculation is done without inflation.

There is a 10% chance the subsidy will be less than £0.90Bn

Expected subsidy = £1.33Bn

N.B.: the expected subsidy differs from the base case value because the former is probabilistically weighted among high, nominal and low cases while the latter assumes a 100% probability that the nominal case occurs for every variable.

There is a 10% chance the subsidy will be more than £1.77Bn

There is a 5% chance the subsidy will be more than £1.88Bn

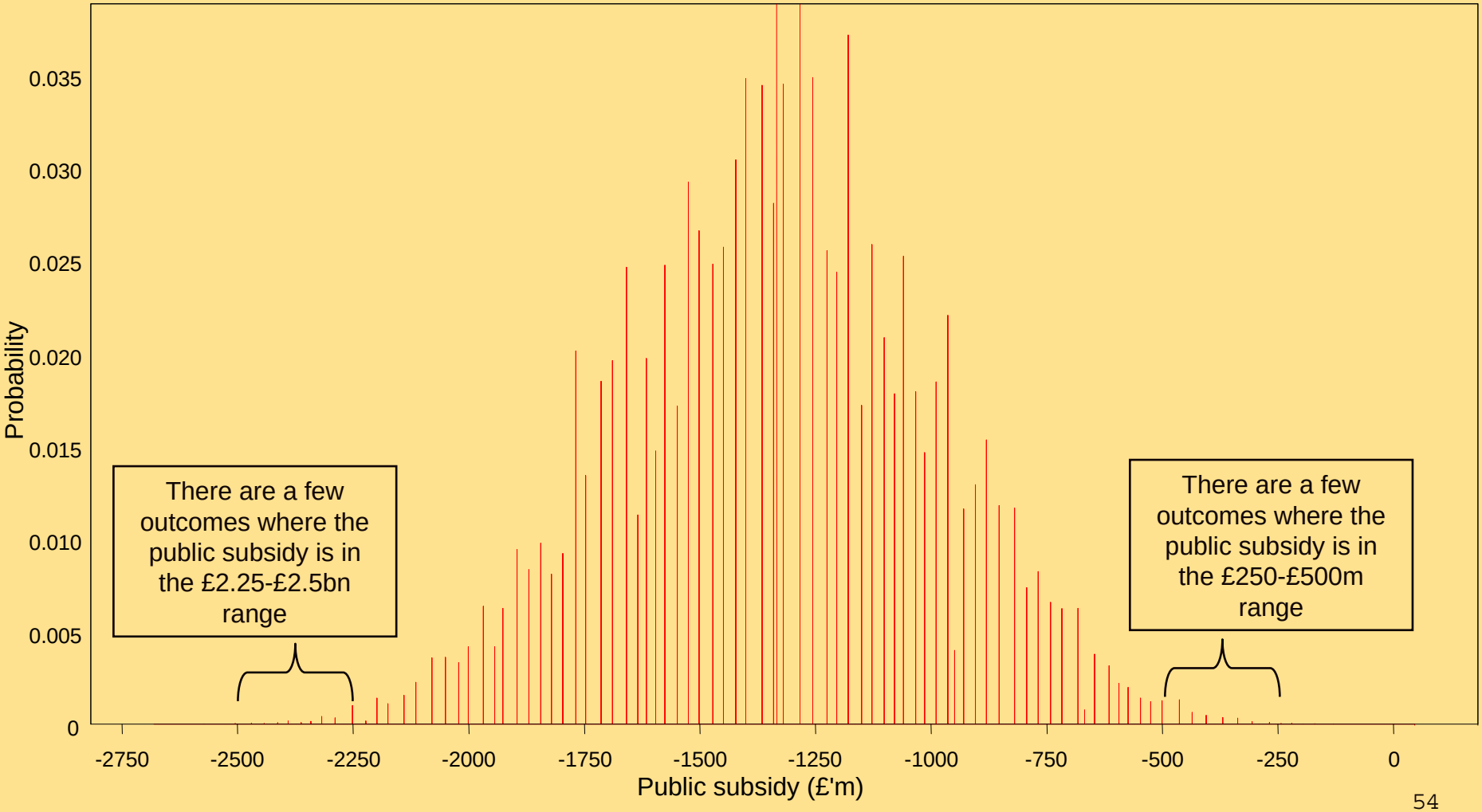
Cumulative probability

1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0

-2750 -2500 -2250 -2000 -1750 -1500 -1250 -1000 -750 -500 -250 0

Public subsidy (£'m)

A frequency distribution shows the likelihood of every possible outcome



The expected costs for the Olympics bid is £3.14Bn; there is an 80% chance that it falls within the range £2.81Bn to £3.48Bn

Variables with less impact are set to their nominal values.

This calculation is done without inflation.

There is a 10% chance the costs will be less than £2.81Bn

Expected costs = £3.14Bn

There is a 10% chance the costs will be more than £3.48Bn

There is a 5% chance the costs will be more than £3.55Bn

Cumulative probability

1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0

-4000 -3800 -3600 -3400 -3200 -3000 -2800 -2600 -2400

Costs (£'m)

The expected revenue for the Olympics bid is £1.80Bn; there is an 80% chance that it falls within the range £1.53Bn to £2.08Bn

Variables with less impact are set to their nominal values.

This calculation is done without inflation.

There is a 10% chance the revenue will be more than £2.08Bn

Expected revenue = £1.80Bn

There is a 10% chance the revenue will be less than £1.53Bn

There is a 5% chance the revenue will be less than £1.46Bn

Cumulative probability

1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0

1300 1400 1500 1600 1700 1800 1900 2000 2100 2200 2300

Revenue (£'m)

The expected public subsidy with inflation is £1.61Bn; there is an 80% chance that it falls within the range £1.10Bn to £2.10Bn

Variables with less impact are set to their nominal values.

This calculation is done with 2.5% inflation p.a.

There is a 10% chance the subsidy will be less than £1.10Bn

Expected subsidy = £1.61Bn

N.B.: the expected subsidy differs from the base case value because the former is probabilistically weighted among high, nominal and low cases while the latter assumes a 100% probability that the nominal case occurs for every variable.

There is a 10% chance the subsidy will be more than £2.10Bn

There is a 5% chance the subsidy will be more than £2.25Bn

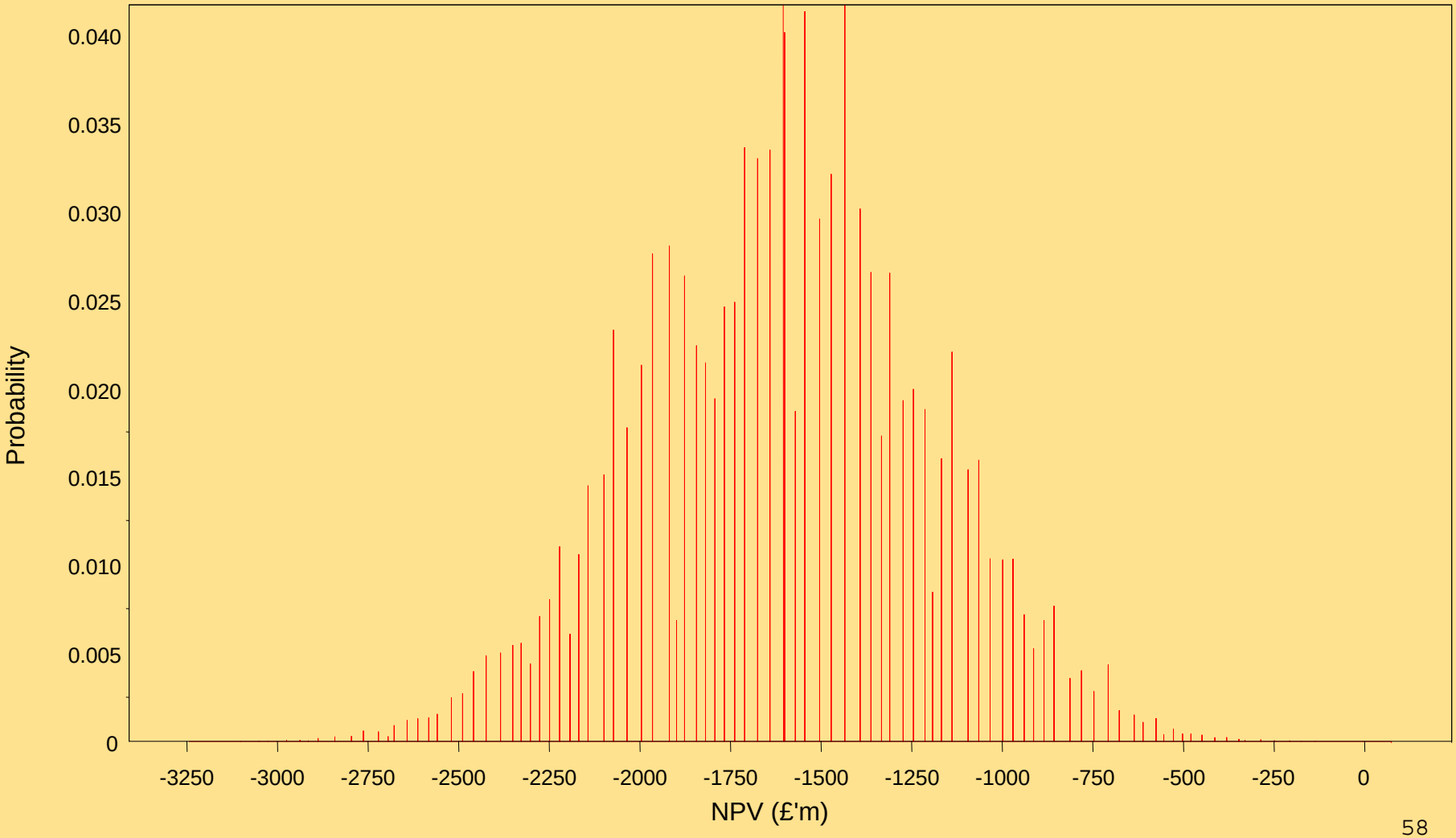
Cumulative probability

1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0

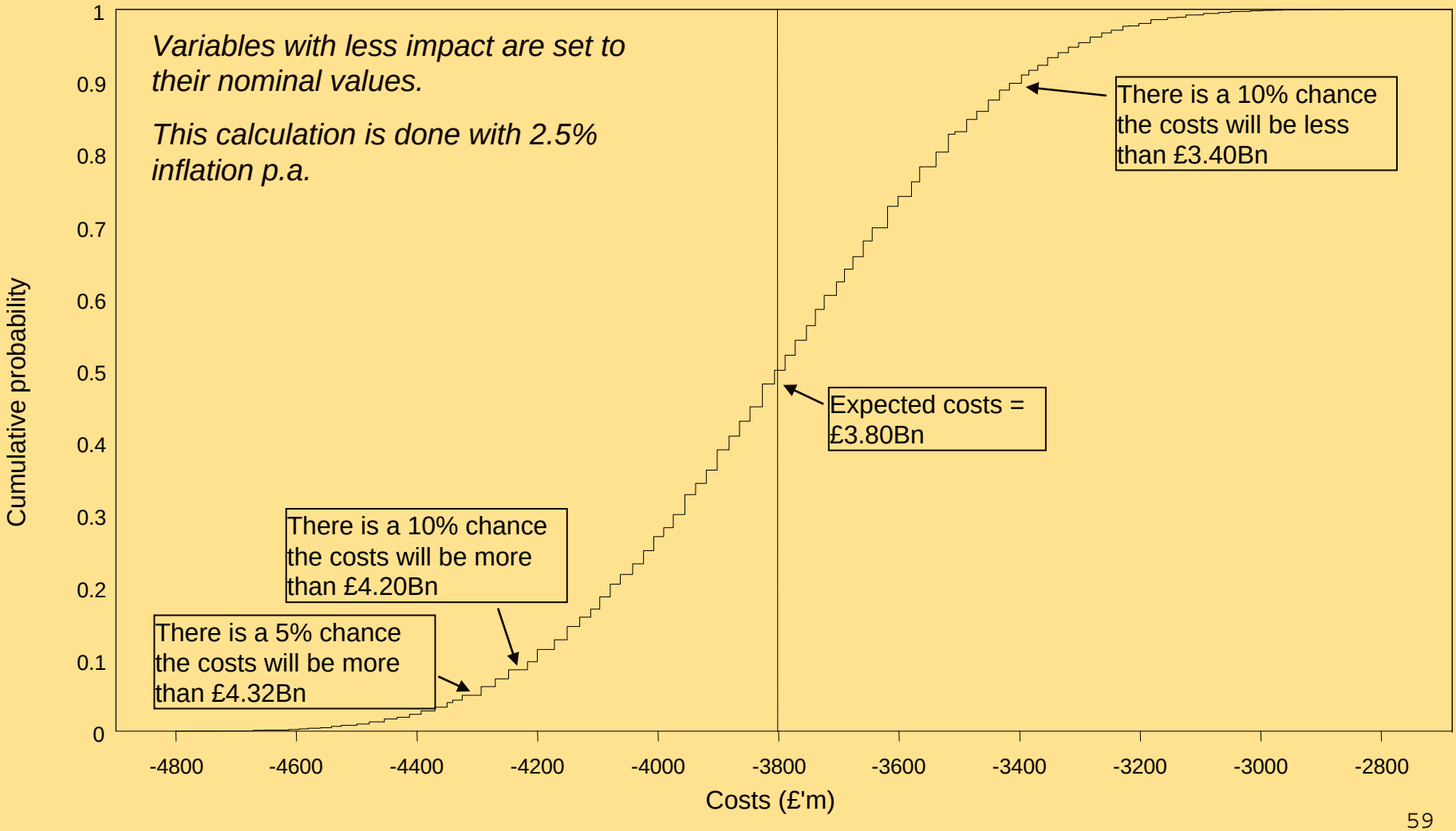
-3250 -3000 -2750 -2500 -2250 -2000 -1750 -1500 -1250 -1000 -750 -500 -250 0

NPV (£'m)

A frequency distribution (with inflation) shows the likelihood of every possible outcome



The expected costs with inflation is £3.80Bn; there is an 80% chance that it falls within the range £3.40Bn to £4.20Bn



The expected revenue with inflation is £2.20Bn; there is an 80% chance that it falls within the range £1.85Bn to £2.54Bn

Variables with less impact are set to their nominal values.

This calculation is done with 2.5% inflation p.a.

There is a 10% chance the revenue will be more than £2.54Bn

Expected revenue = £2.20Bn

There is a 10% chance the revenue will be less than £1.85Bn

There is a 5% chance the revenue will be less than £1.79Bn

Cumulative probability

1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0

1500 1600 1700 1800 1900 2000 2100 2200 2300 2400 2500 2600 2700 2800 2900

Revenue (£'m)

Assumptions for NPV calculation

- Two discount factors:
  - 6% and 3.5%
- Capex for transportation infrastructure starts in 2006 with the following six-year timing profile:
  - 5% in 2005
  - 10% in 2006 to 2007
  - 25% in 2008 to 2010
- Look of London costs are allocated as follows:
  - 25% in 2011
  - 75% in 2012
- Timing of all other costs and revenues are as in Arup spreadsheet.

The NPV of the Olympics bid is negative at 6%

Variables with less impact are set to their nominal values.

This calculation is done without inflation.

Cumulative probability

1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0

Expected NPV
= - £0.87Bn

-1800 -1600 -1400 -1200 -1000 -800 -600 -400 -200 0

NPV (£'m)

The NPV of the Olympics bid is negative at 3.5%

Variables with less impact are set to their nominal values.

This calculation is done without inflation.

Cumulative probability

1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0

Expected NPV
= - £1.04Bn

-2000 -1800 -1600 -1400 -1200 -1000 -800 -600 -400 -200 0

NPV (£'m)

Assessment of control

Variable	Degree of control (HMG)	Confidence in ranges	Issues
Land acquisition	Medium to high	High	Assigning vesting powers to LOCOG, legal proceedings, timing, % of site assembly covering the CPO
Construction & infrastructure	Low/Medium	Moderate	Scope, being held to ransom (e.g., Jubilee line), transaction costs with 3rd parties
TV rights	Low	Moderate	Exogenous market conditions, timing of deal, structure of OBC
Land disposal value	Low	Moderate	Driven by market conditions, transaction costs may escalate, oversupply of land in an area
Administration	High	Moderate	Lack of control in salary of experts and committee members
Elite sports funding	High	High	Managing public expectations
Local sponsorship	Medium/Low	Moderate	Driven by exogenous factors, including market advertising, sponsor of the events, competing alternatives
Transport CAPEX	Medium	Low	Complex, large-scale capital project with interdependencies
Ticket sales	Medium/High	Low/Moderate	Price (affordability), no. sold, seat kills, adminstration costs
Security	Medium	Moderate/High	OSO administration and planning costs more variable than direct spend
Technology/telecoms	Low	Low	Lack of expertise available for assessment, future development uncertain
Transport OPEX	Medium	Moderate/Low	Complexity, correlation to transport CAPEX

Wider economic costs and benefits

- Tourism benefits measured by enhanced expenditure (2002 prices, before discounting):
  - Overseas residents in London during Olympics - £143-£219 million in 2012
  - Overseas residents outside London during Olympics - £94-£163 million in 2012
  - Pre- and post- Olympics - £30 million (as per Arup)
  - Paralympics - £35 million (as per Arup)
  - “Knock-on” effect - £61 million per annum in 2011-2013 (as per Arup)
  - Domestic residents (net displaced overseas trips) - £51-£207 million
- Congestion costs measured by loss of productivity
  - Depend critically on the condition of the transport network
  - Using the costs of recent tube strikes/rail disruptions as a proxy suggests costs might reach £100 million

Conclusion - summary

- The expected cost without inflation is £3.14 billion with an 80% chance of it falling between £2.81 billion and £3.48 billion.
- The expected cost with 2.5% inflation is £3.80billion with an 80% chance of it falling between £3.40 billion and £4.20 billion.
- The expected revenue without inflation is £1.80 billion with an 80% chance of it falling between £1.53 billion and £2.08 billion.
- The expected revenue with 2.5% inflation is £2.20 billion with an 80% chance of it falling between £1.85 billion and £2.54 billion.
- The expected public subsidy without inflation is £1.33 billion with an 80% chance of it falling between £0.90 billion and £1.77 billion.
- The expected public subsidy with 2.5% inflation is £1.61 billion with an 80% chance of it falling between £1.10 billion and £2.10 billion.
- The NPV of the Olympics bid at a 6.0% discount rate is -£0.87 billion with an 80% chance it is between -£1.15 billion and -£0.60 billion.
- The NPV of the Olympics bid at a 3.5% discount rate is -£1.04 billion with an 80% chance it is between -£1.37 billion and -£0.72 billion.

Conclusions - interpretation

- All results are based on the assessments completed on Friday based on input from DCMS, Arup and PwC.
- The ranges for both public subsidy and NPV appear relatively small given the timeframes and nature of the bid decision.
- It is clear from the asymmetric nature of some of the variables that there is a long tail to the distribution: in order to quantify the size of the tail, further work would be required based on expert assessment and/or analysis of the historical data.
- In particular, we would recommend revisiting those assessments where only limited work has been undertaken, where there is little HMG control and/or where considerable uncertainty was highlighted during Friday's discussion: this would include areas on the revenue side (eg ticket sales) and the cost side (eg administration).
- Given this, we would expect that with further work, the ranges for both the public subsidy and NPV would initially broaden until appropriate management control can be introduced.