

[dstl]

01 May 2014

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Ministry
of Defence

SCAF Cost Challenge 2014

Team DSTL – K Etheridge, T Lodge & A Smith



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A bit about us.....



Katharine



Tommy



Ash

Background - The family



Assumptions - The move



12 Months Before Move

The situation

- The management stated that there is a business need to move to our New York City, starting next September
- Discussed it with partner – prepared to move
- Line manager needs a first idea of what it will cost to move; is it feasible?
- Need a quick ROM estimate

Analogous Estimate

- When we want to get an idea of how much something costs **quickly** and with **low effort**...



Analogous Estimate

- We last moved house 3 years ago...

Analogy:	House move from Southampton to South London	Assume stays about the same
Fees & Tax:	£25,900	←
Transit / Removals:	£400	←
Relative distance to NYC:	50x	Assume scales with distance
Estimated cost this time:	£45,900	

Analogous Estimate

- Would tell our manager – ‘expect it to be of the order £40-50k’
- Strengths
 - Quick and easy ROM estimate – may quickly rule an option ‘in’ or ‘out’
- Weaknesses
 - Easy to miss costs (e.g. a pre-visit) or apply flawed logic (e.g. scaling entire removals cost)
 - Low resolution – can’t break costs out

8 Months Before Move

The Situation

- Chosen for the post
- Finance team requires a preliminary estimate including a pre-move recce visit
- 'Initial Gate' decision point
- Decide to use a parametric approach

Parametric Estimating



Family trip to Washington D.C.

- Low-season
- 14 nights
- £6600



Family break – Orlando, Florida

- High-season
- 8 nights
- £5860 including attractions

Parametric Estimating

	Fixed	Variable	Variable portion depends on...
Flights	200	1,895	Distance, Season
Hotel	-	1,988	Length of stay, Season
Food	-	1,512	Length of Stay
Other	120	880	Length of Stay

	Fixed	Variable	Variable portion depends on...
Flights	220	2,650	Distance, Season
Hotel	-	1,040	Length of stay, Season
Food	-	780	Length of Stay
Other	140	372	Length of Stay
Attractions	-	660	N/A

- Identified costs which do not change – ‘Fixed’
- Identified costs which are expected to scale, and which parameters drive them

Parametric Estimating

$$Previsit\ Cost = C_{Flights} + C_{Hotel} + C_{Food} + C_{Other}$$



$$C_{Other} = f_0 + k_0 T$$

With f_0 = avg fixed costs (other)
 k_0 = basic daily rate (other)
T = stay duration

Parametric Estimating

	Fixed	Variable	Parameters
Flights	200	1,895	D, σ_1
Hotel	-	1,988	T, σ_2
Food	-	1,512	T
Other	120	880	T

	Fixed	Variable	Parameters
Flights	220	2,650	D, σ_1
Hotel	-	1,040	T, σ_2
Food	-	780	T
Other	140	372	T
Attractions	-	660	N/A

London to D.C. Distance = 6390 n.m.

Let $\sigma_1 = 1$ during low-season

$$C_{Flights} = 200 + (1 * \delta * 6390)$$

$$\Rightarrow \delta = 0.30 \text{ £/n.m.}$$

$$C_{Flights} = f_F + \sigma_1 \delta D$$

f_F = fixed costs (flight)

σ_1 = flight high-season mult.

δ = distance multiplier

D = Actual distance (n.m.)

Parametric Estimating

	Fixed	Variable	Parameters
Flights	200	1,895	D, σ_1
Hotel	-	1,988	T, σ_2
Food	-	1,512	T
Other	120	880	T

	Fixed	Variable	Parameters
Flights	220	2,650	D, σ_1
Hotel	-	1,040	T, σ_2
Food	-	780	T
Other	140	372	T
Attractions	-	660	N/A

Use second case to find σ_1 :

$$2650 = 220 + \sigma_1 * 0.30 * 7360$$

$$\Rightarrow \sigma_1 = 1.18 \text{ (high-season)}$$

$$C_{Flights} = f_F + \sigma_1 \delta D$$

f_F = fixed costs (flight)

σ_1 = flight high-season mult.

δ = distance multiplier

D = Actual distance (n.m.)

Parametric Estimating

- Rinse and repeat for each cost element

- Using data for NY produce parametric estimate

Total Cost Estimate:

£35,447



Pre-visit

Distance: 6,034 n.m. return trip
 Season: On-Season
 Trip Duration: 10 nights

Move

Distance: 3,017 n.m.
 Season: Off-Season
 House Buy/Sell Price: £450k



Flights	2,325
Hotels	1,300
Food	1,042
Other expenses	699
Pre-visit Estimate	5,366
Belongings Transit	2,864
Travel Costs	1,105
Other expenses	187
House Fees & Taxes	25,925
Move Estimate	30,081

Parametric Estimating

Limitations

- Small sample size:
 - Max 2 parameters possible per cost element
 - Limited amount of fidelity
- Does not capture risks and uncertainty

Strengths

- Fairly detailed cost breakdown
- Easy to assess sensitivity of estimate to parameters

6 Months Before Move

The Situation

- Pre-move activities need to begin soon
- Asked to submit expenses claim for relocation in advance
- Full bottom-up estimate required, capturing risk and uncertainty
- Using risk management, must ensure that we are **not short of funds or left to fund anything ourselves**

House and Location Options

- Also analysed the housing options available:

Decision 1 – Move or Do Nothing?	Move							
Decision 2 – UK Sell or Rent Out?	Sell				Rent out			
Decision 3 – NY Buy or Rent?	Rent		Buy		Rent		Buy	
Decision 4 – NY City or Suburbs	Suburb	City	Suburb	City	Suburb	City	Suburb	City

- Considered family preference, value of assets, interest rates, house market growth indices...
- Affordability and 10 year net worth (in NPV)

House and Location Options

Decision 1 – UK Sell or Rent Out?	Sell			Rent out		
Decision 2 – NY Buy or Rent?	Rent	Buy		Rent		Buy
Decision 3 – NY City or Suburbs	Suburb City	Suburb	City	Suburb	City	Suburb City

Poor 10-year net worth

Family preference

Not affordable

House and Location Options

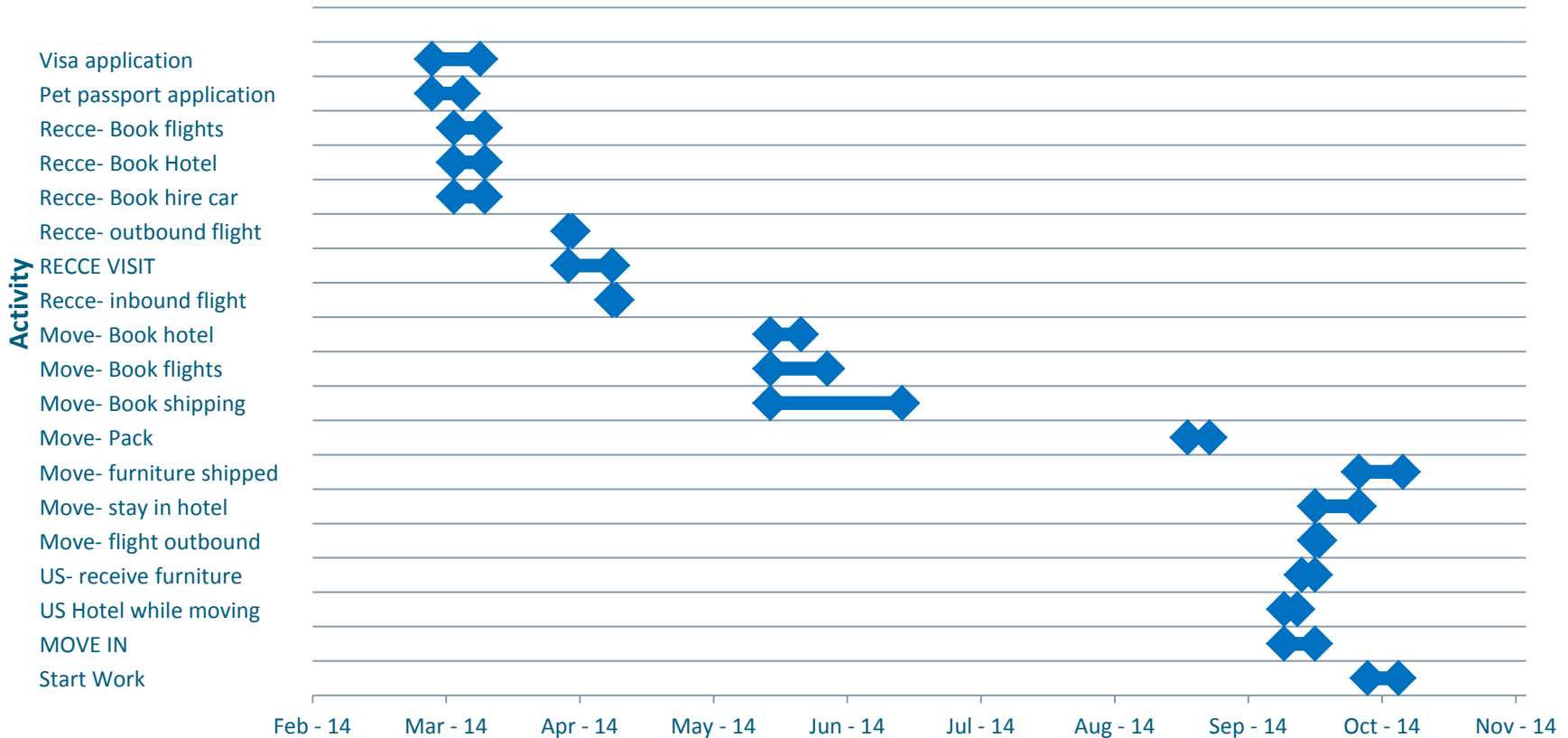
- Left with 2 options:

	Sell UK to Buy (Suburbs)	Rent out UK to Rent (Suburbs)
Advantages	Greater security/stability	Greater net worth after 10 years
Disadvantages	Additional £70k upfront	Reduced security/stability

Preferred

Estimate Process- Stage 1

Gantt chart



Estimate Process- Stage 2



Estimate Process- Stage 3

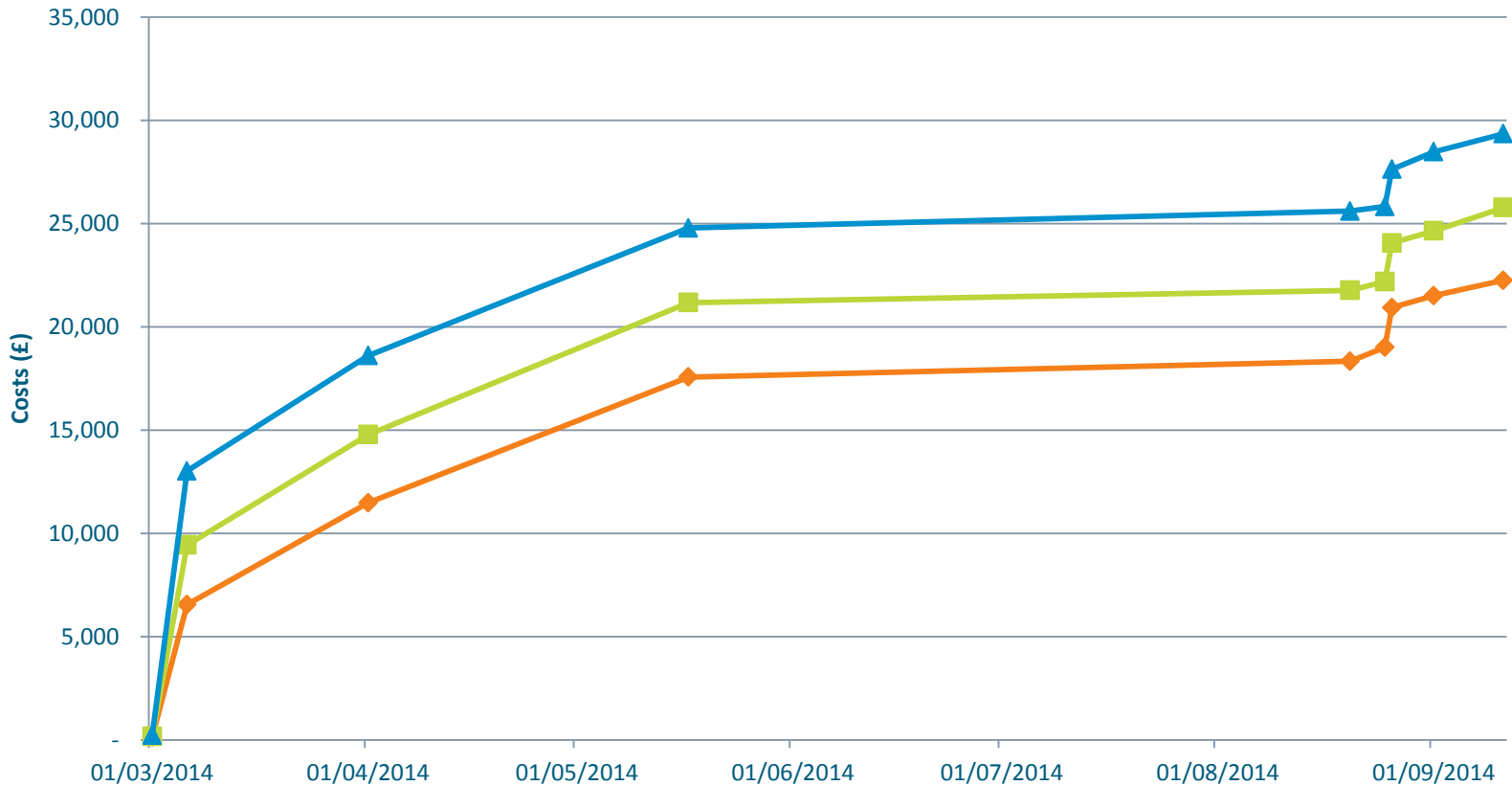
- Assigned cost estimates to each activity and risk
- Open source research



Estimate Process- Stage 4

Forecast expenditure

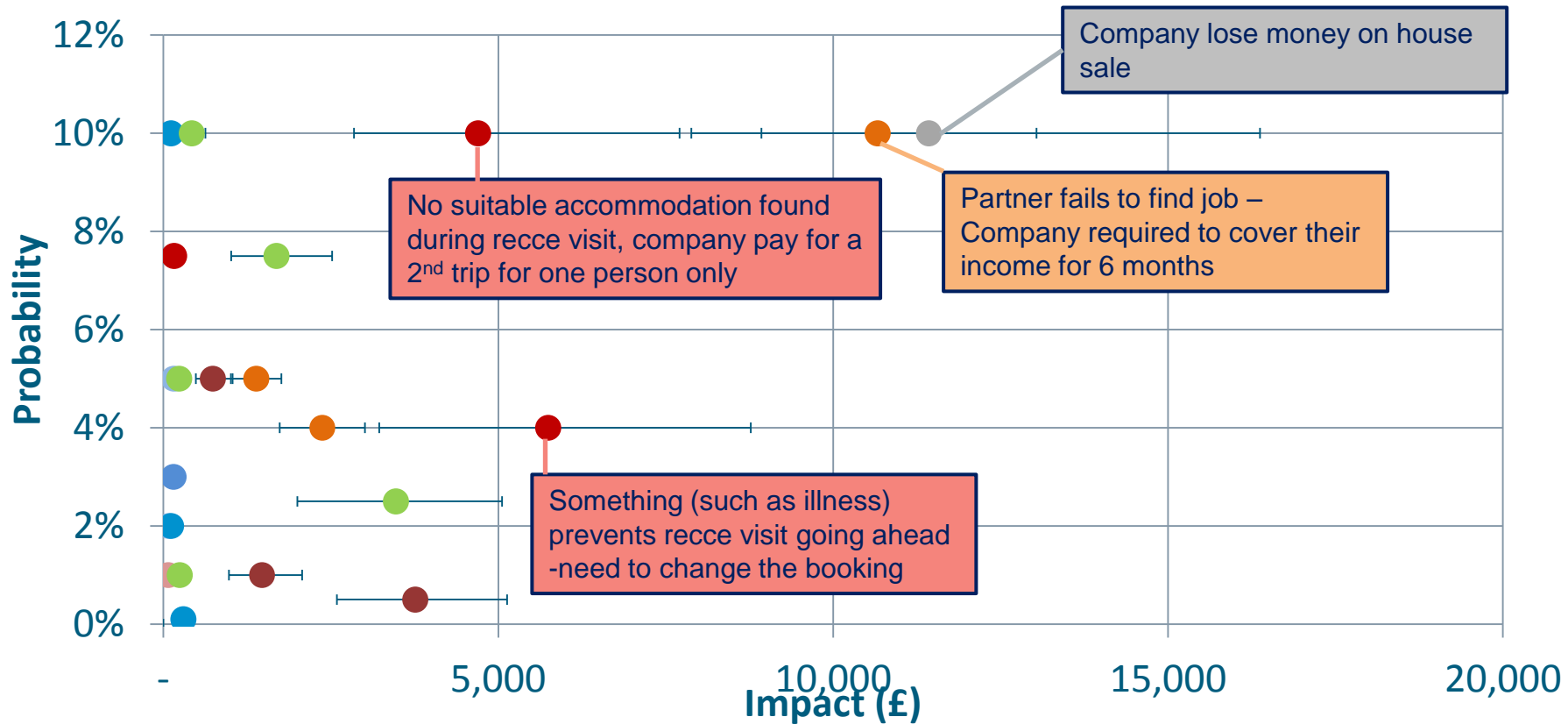
—◆— 10% —■— 50% —▲— 90%



Risk analysis

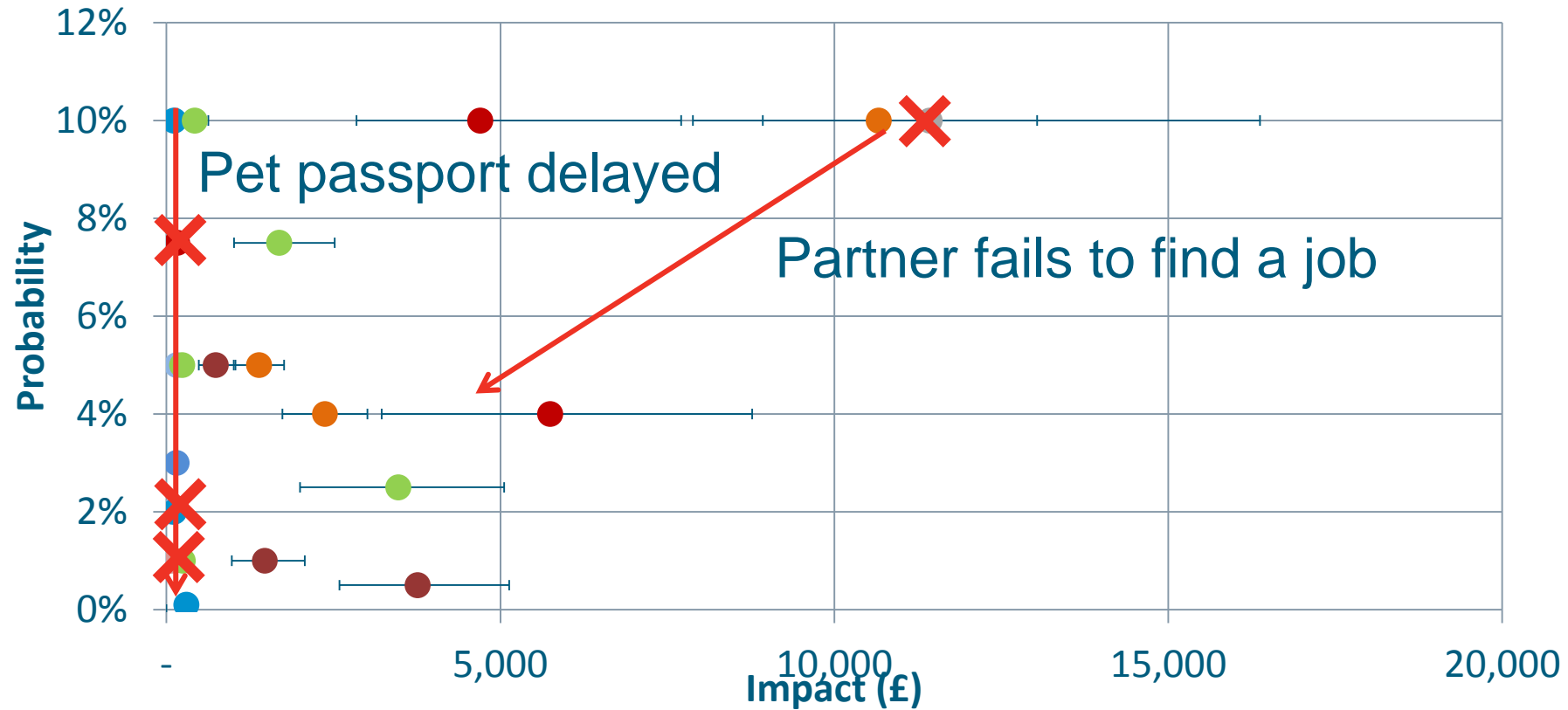
Risks – Impact vs probability plot

■ Recce Visit
 ■ Leaving the UK
 ■ Transit
 ■ US Arrival



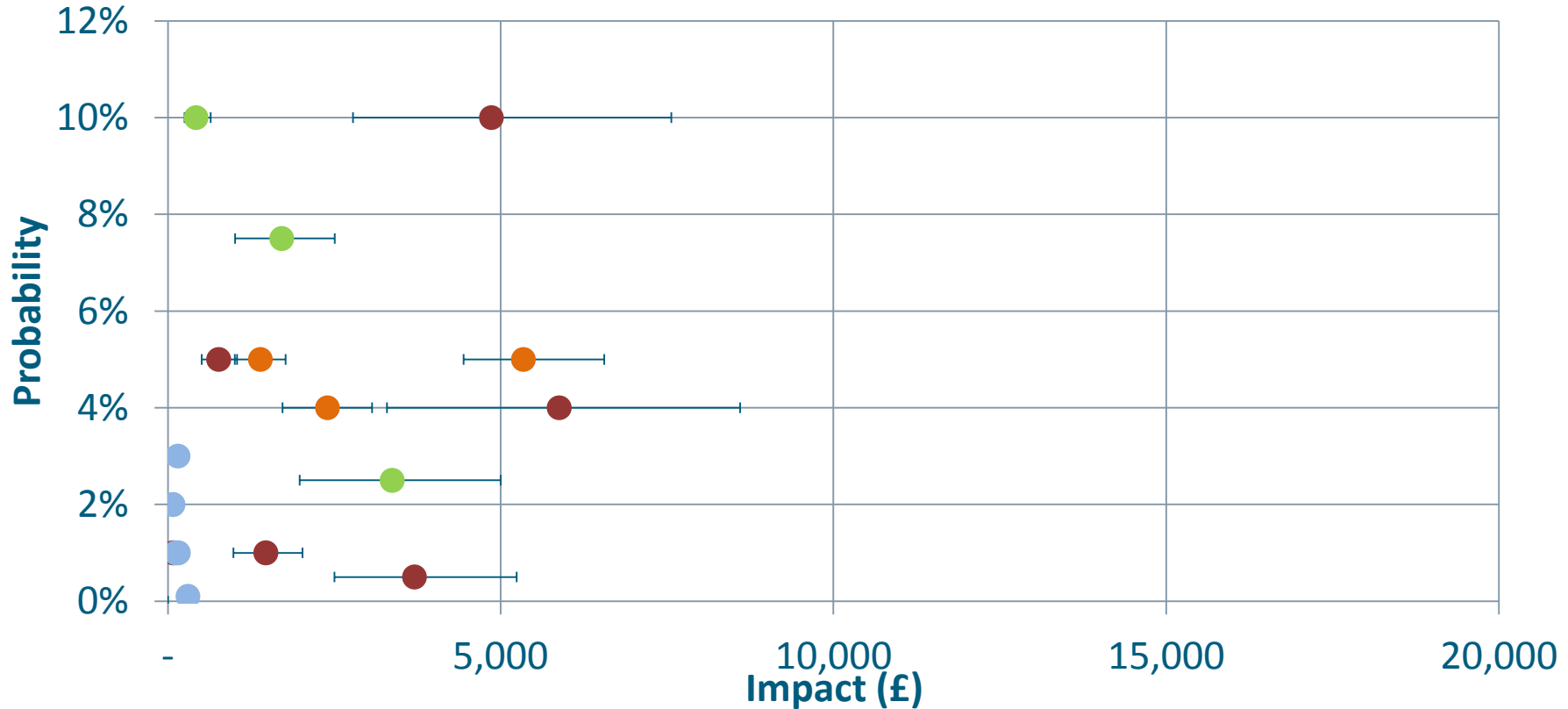
Risks – Impact vs probability plot

■ Recce Visit ■ Leaving the UK ■ Transit ■ US Arrival



Risk – After actions

■ Recce Visit ■ Leaving the UK ■ Transit ■ US Arrival



Risk – Mitigation

- Total cost of mitigating action £1,120
- Total risk before action

10%	50%	90%
-	£387	£11,420

- Total risk after actions and exclusions

10%	50%	90%
-	-	£5,237

- Difference

10%	50%	90%
-	£387	£6,183

Cash flow risks — Costs that are recoverable from insurance

Incident on recce visit (late/missing bags etc). Cashflow needed to replace items

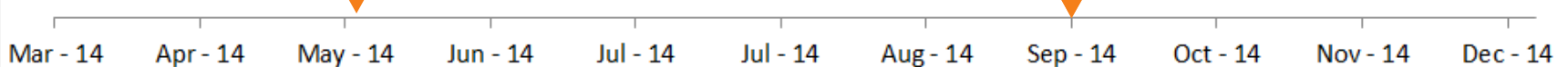
10%	50%	90%
437	840	1,513

Furnishings damaged in transit. Cash flow needed to replace items

10%	50%	90%
359	561	801

Furnishings lost in transit. Cash flow needed to replace items

10%	50%	90%
777	1,136	1,618



Summary of our estimate

- The totals calculated, including risk, are:

10%	50%	90%
£24,000	£28,200	£33,600

- Recommend an advance for the 90% point as well as taking mitigations as stated

Analogous Estimate:
'expect it to be of the
order **£40-50k**'

Parametric
Estimate: **£35,400**

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