Mervyn King and Maynard Keynes on Money and Uncertainty

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Structure of the paper

1. The views of King and Keynes
2. The building blocks of the model
3. Putting the model to work
4. Conclusions

Biographies

1

John Maynard Keynes: (1883-1946)

(1921) *A Treatise on Probability*

(1936) *General Theory of Employment, Interest, and Money*

(1937) "The General Theory of Employment" *QJE*

Mervyn King: (1948-)

(2003-13) Governor of the Bank of England

(2016) *The End of Alchemy*

(2020) *Radical Uncertainty* (with John Kay)

Keynes on Money and Uncertainty

"Thus the fact that our knowledge of the future is fluctuating, vague and uncertain, renders Wealth a peculiarly unsuitable subject for the methods of the classical economic theory. [p.213*]

"**By "uncertain" knowledge**, let me explain, I do not mean merely to distinguish what is known for certain from what is only probable. The game of roulette is not subject, in this sense, to uncertainty … About these [uncertain] matters **there is no scientific basis on which to form any calculable probability whatever. We simply do not know**." [pp213-14]

*(1937) "The General Theory of Employment" *QJE*

Keynes on Money and Uncertainty

"**Knowing that our own individual judgment is worthless, we endeavor to fall back on the judgment of the rest of the world** which is perhaps better informed. That is, we endeavour to conform with the behavior of the majority or the average. The psychology of a society of individuals each of whom is endeavoring to copy the others leads to what we may strictly term a ***conventional* judgment**." [pp213-14]

Keynes on Money and Uncertainty

"Now a practical theory of the future … being based on so flimsy a foundation, it is subject to **sudden and violent changes**. The practice of calmness and immobility, of certainty and security, suddenly breaks down. … The forces of disillusion may suddenly impose a new conventional basis of valuation [of assets]. All those pretty, polite techniques, made for a well-panelled Board Room and a nicely regulated market, are liable to collapse." [pp214-15]

"…I accuse the classical economic theory of being itself one of these pretty, polite techniques which tries to deal with the present by abstracting from the fact that we know very little about the future." [p.215]

Keynes on Money and Uncertainty

"… **our desire to hold Money as a store of wealth is a barometer of the degree of our distrust of our own calculations and conventions concerning the future**. Even tho this feeling about Money is itself conventional or instinctive, it operates, so to speak, at a deeper level of our motivation. It takes charge at the moments when the higher, more precarious conventions have weakened. **The possession of actual money lulls our disquietude**; …" [p.216]

King on Money and Uncertainty

"More generally, **in a world of radical uncertainty**, where it is not possible to compute the 'expected utility' of an action, **there is no such thing as optimising behaviour.** The fundamental point about radical uncertainty is that if we don't know what the future might hold, we don't know, and there is no point pretending otherwise. Right through his life, John Maynard **Keynes was convinced that radical uncertainty, as it has become known, was the driving force behind the behaviour of a capitalist economy**." [p.131*]

*(2016) *The End of Alchemy*

King on Money and Uncertainty

"The narrative is a story that integrates the most important pieces of information in order to provide a basis for choosing … [p.136] **Narratives play an important part in the coping strategies of investors.** Under radical uncertainty, market prices are determined not by objective fundamentals but by narratives about fundamentals. Those stories can be influenced by important players, such as central banks and governments, but also by changes in intellectual fashion or a realisation that the existing story is misleading …" [p.153]

King on Money and Uncertainty

"Under radical uncertainty, investors make judgements, perhaps based on a coping strategy, and with the benefit of hindsight, these are sometimes described as 'mistakes'. But beliefs change, and who is to know which beliefs are correct? The valuations in financial markets are for the moment. They **change quickly, and sometimes violently**, reflecting uncertain knowledge of the future." [p.154]

King on Money and Uncertainty

"Financial markets can help us to cope with an uncertain future provided we do not succumb to the danger of believing that uncertainty has been turned into calculable risk. … The future is simply unknowable. And in a capitalist economy, money, banking and financial markets are institutions that have evolved to provide a way of coping with an unpredictable future." [p.154-55]

"For that reason, a capitalist economy is inherently a monetary economy. Money has a special role. … **Money is not just a means of buying 'stuff' but a way of dealing with an uncertain future [or 'stuff happens'].**" [p.155 and p.332]

Part 1: summary

1

1. Economic players are embedded in a world of radical uncertainty

2. People use narratives to construct conventional beliefs to assuage their uncertainty

3. Behaviour – such as liquidity* demand – depends on such constructed, conventional beliefs

*A liquid asset is a tradeable asset whose conventional value is bounded below under uncertainty

Part 1: conclusions of King and Keynes

1. Probabilities can’t characterize our attitude to uncertainty
2. People can’t optimize in the absence of probabilities
3. If optimization is out, maths is otiose

Parts 1-2: the transition

1,2

1. Probability is a measure over $\mathbb{R}$, so we use a vector-measure over $\mathbb{R}^3$ to characterize uncertainty

2. People optimize over $\mathbb{R}^3$

3. Optimization is okay, maths is okay, but not as we currently do it

Part 2: Types of beliefs

1. **Objective beliefs** are just those given to us by Nature and known to us through the Physical Sciences, Engineering, Life Sciences, etc.

2. **Subjective beliefs** are those we individually impose on Nature in the absence of objective probabilities.

3. **Conventional beliefs** are those beliefs held by a group of people and which obey the following five conditions:

Conventional beliefs

1. There is a **well-identified group of like-minded decision makers** – like-minded meaning that their prior beliefs are ‘similar’

2. There is a **well-defined minimum belief amongst those decision makers** – meaning that there is an identified convex capacity that contains their subjective beliefs

3. All decision makers in the group think that the **jointly-held (i.e., consensus) beliefs have a stronger epistemological status than purely subjective beliefs**

Conventional beliefs

Additionally, if we suppose that the following two further conditions are satisfied, then we have a convention:

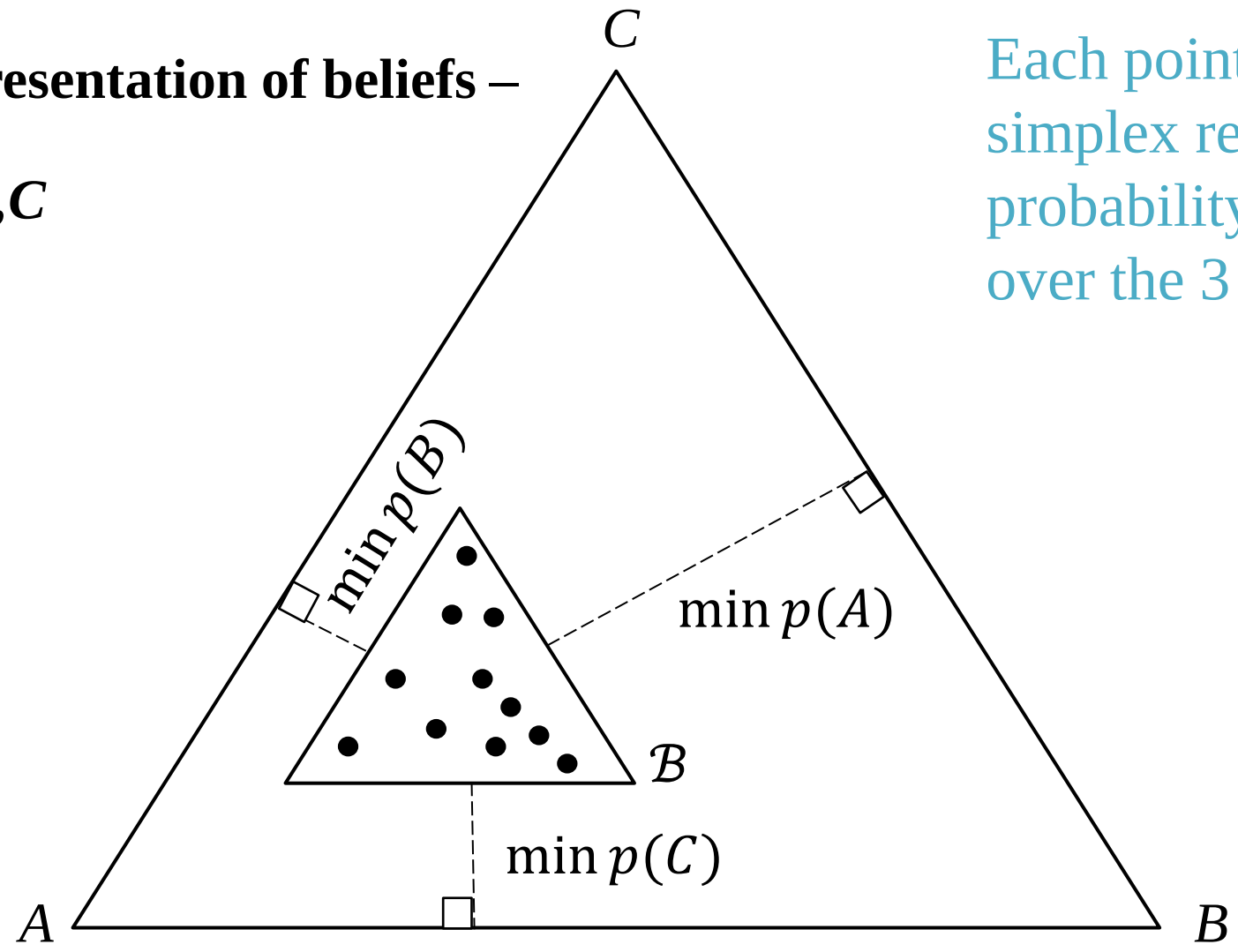
4. **Each decision maker behaves differently if 1-3 are true** than if they are not – i.e., conventions impact on behaviour (beliefs aren't pieties)

5. **1-4 are common knowledge**

graphical representation of beliefs –

3 events, *A*, *B* ,*C*

Unit simplex



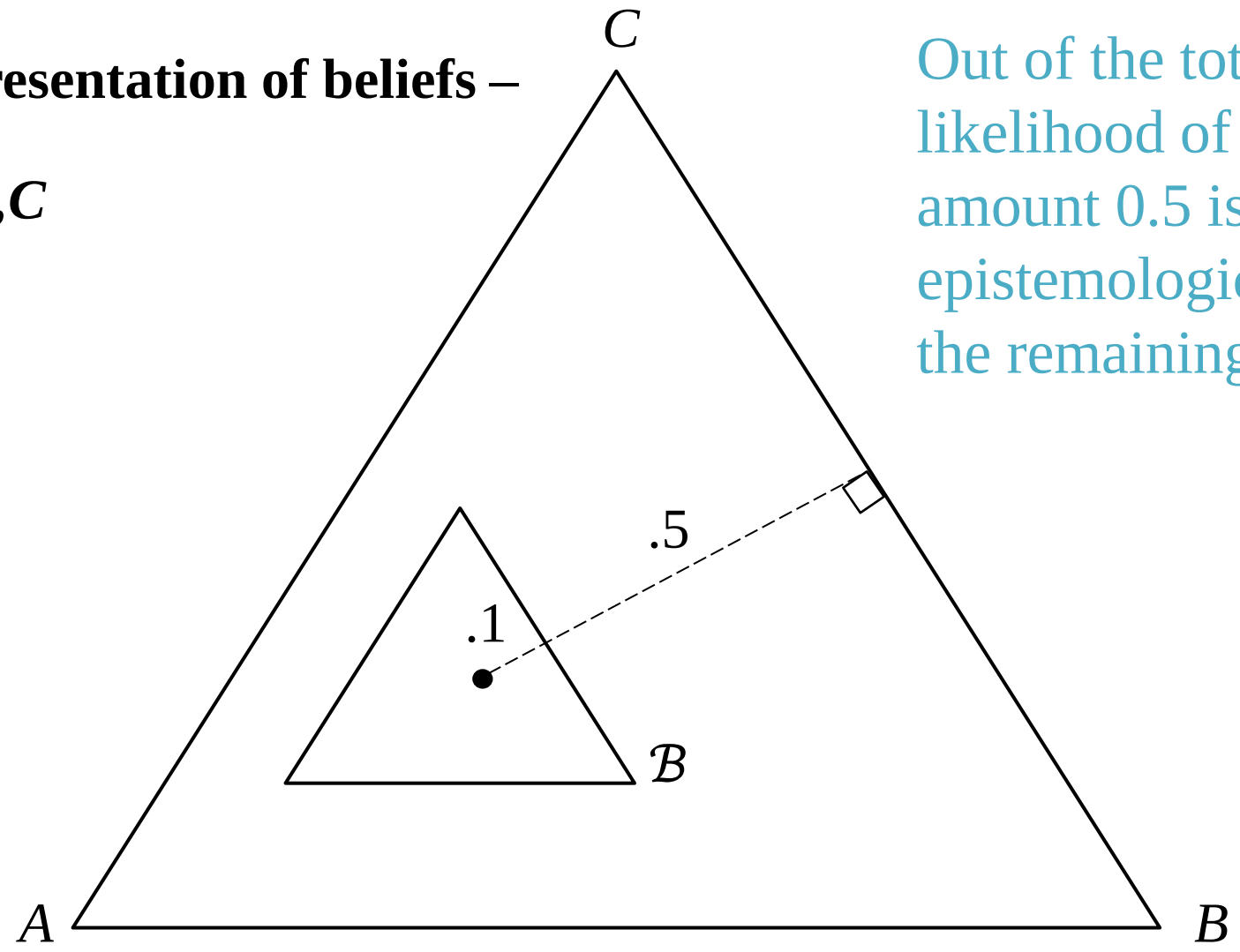
Each point in the unit simplex represents a probability distribution over the 3 events

2

graphical representation of beliefs –

3 events, *A*, *B* ,*C*

Unit simplex



Out of the total belief in the likelihood of A (0.6), the amount 0.5 is treated as more epistemologically secure than the remaining 0.1. Why?

Because the amount 0.5 is supported by a convention that others hold, whereas the remaining 0.1 is purely subjective.

Conventional beliefs and the demand for money

How do conventional beliefs impact demand for money?

Consider an investor who thinks that the probability that the Federal Reserve Bank will raise the cash rate by 100bp is 60%. Will she feel and behave in the same way in the following two scenarios?

1. She has only her own subjective beliefs to go on and doesn't know what anyone else believes

2. She is aware that there is a wide consensus that the Fed will act with probability of at least 50%

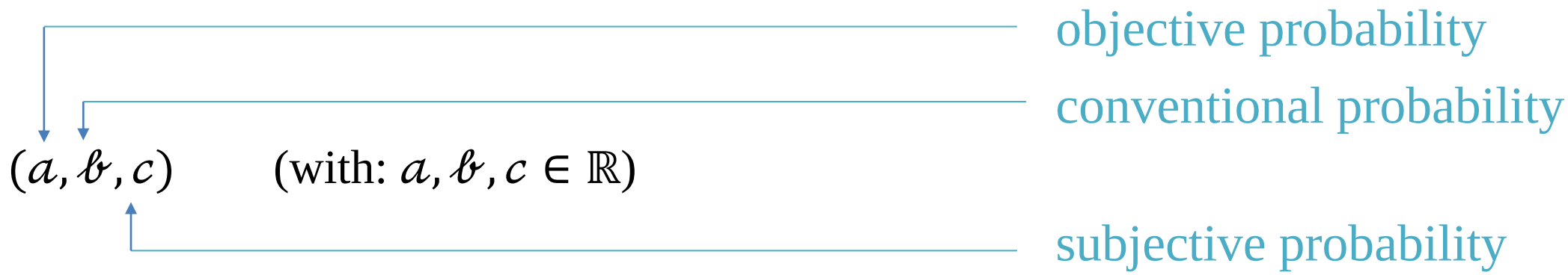
Conventional beliefs and the demand for money 2

How do conventional beliefs impact demand for money?

Consider a farmer who has only subjective beliefs there will be a market for her crop. She may decide to plant less and hold more of her capital as cash given she lacks confidence in her subjective beliefs.

However, if the same quantum of belief were supported by a widely held convention, she might choose to hold more of her capital as planted crops and less as cash, not because her probabilities have changed but because her confidence in those probabilistic beliefs has changed as those views are more widely held.

The Ring of Beliefs – the maths bit



$$(a, b, c) + (d, e, f) = (a + d,\ b + e,\ c + f)$$

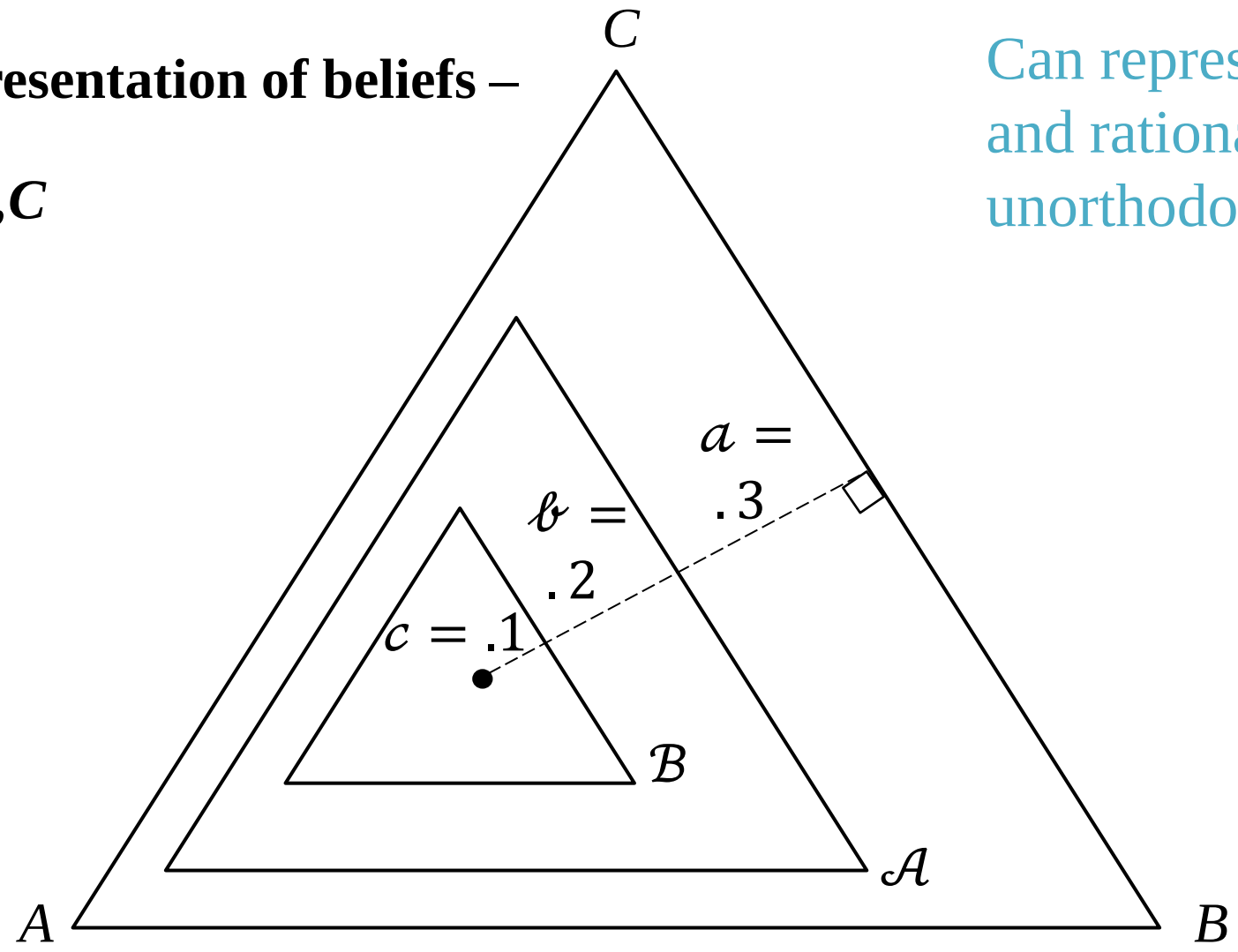
$$(a, b, c).(d, e, f) = (ad, ae + bd + be, c(d + e) + (a + b + c)f)$$

$$\mathbb{E}_3 \cong \mathbb{R} \times \mathbb{R} \times \mathbb{R}$$

graphical representation of beliefs –

3 events, *A*, *B* ,*C*

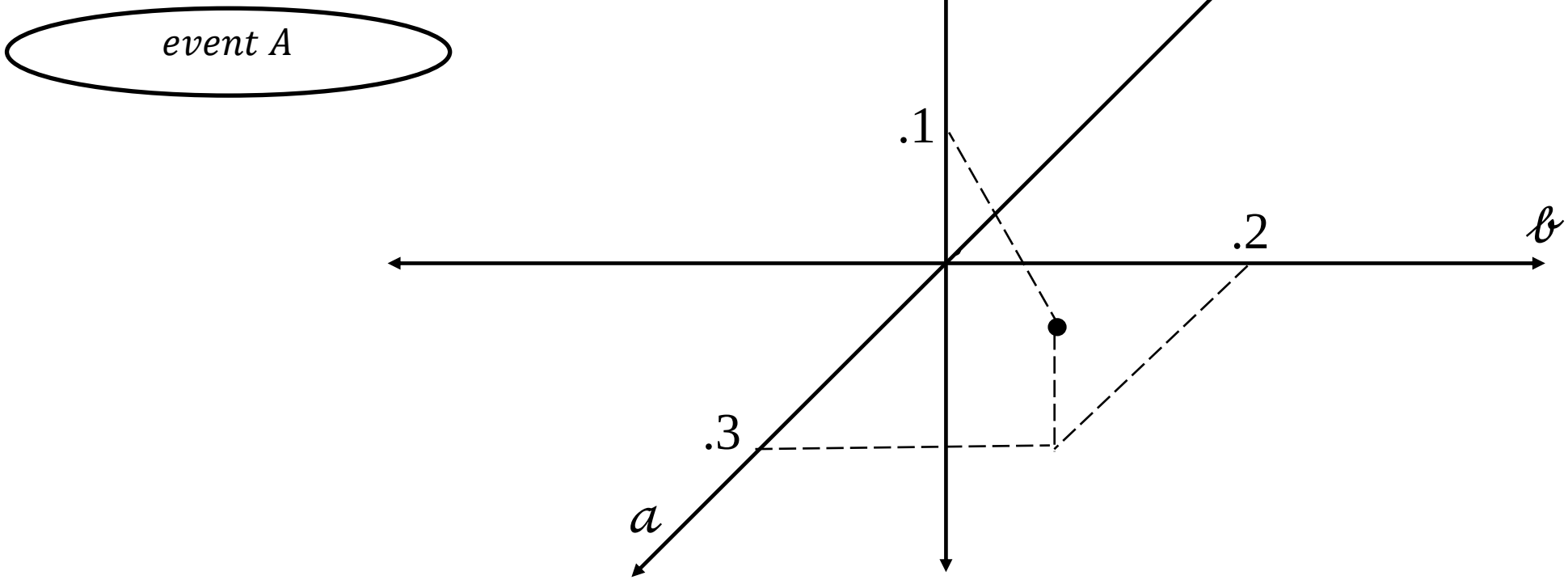
Unit simplex



Can represent orthodox and rational but unorthodox beliefs

2

graphical representation of beliefs



2

beliefs

algebra of events

We use the following notation:

$\mathcal{I}: F \rightarrow [0,1]$: is a convex capacity, normalized to unity ($\mathcal{I}(\Omega) = 1$), and whose empty set is null ($\mathcal{I}(\emptyset) = 0$) that describes a positive *belief* in favour of A

A convex capacity satisfies:

$$\mathcal{I}(A \cup B) \geq \mathcal{I}(A) + \mathcal{I}(B) \qquad when\ \ A \cap B = \emptyset$$

distinguishes a capacity from a probability (cf. Ellsberg paradox)

2

Beliefs as capacities

$\mathcal{A}: F \rightarrow [0,1]$: is a convex capacity that describes the *objective belief* in favour of A

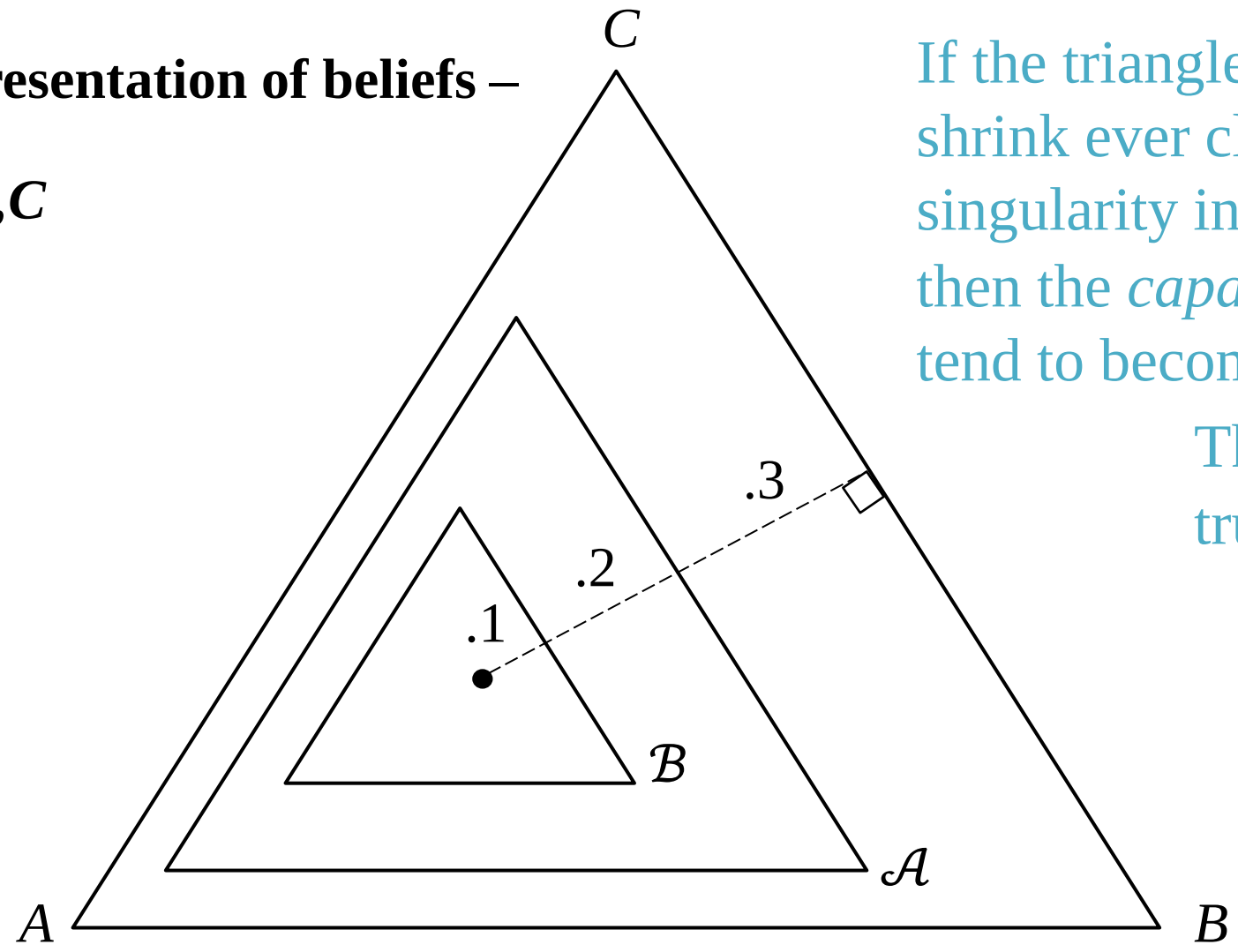
$\mathcal{B}: F \rightarrow [0,1]$: is a convex capacity that describes the *combined objective and consensus belief* in favour of A

Consensus beliefs are rational: i.e., $core(\mathcal{B}) \subseteq core(\mathcal{A})$

graphical representation of beliefs –

3 events, *A*, *B* ,*C*

Unit simplex



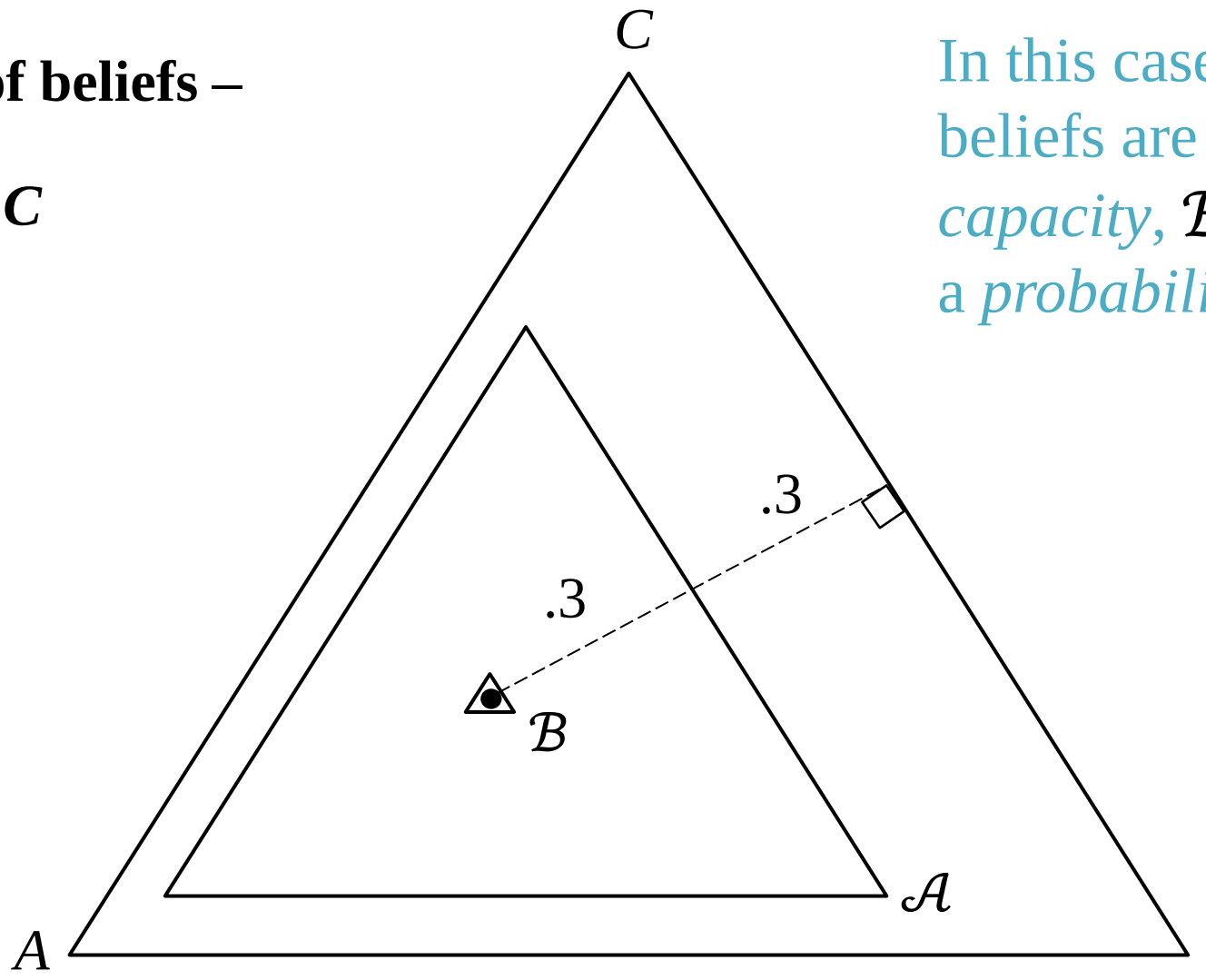
If the triangle, $\mathcal{B}$, were to shrink ever closer to a singularity in the unit simplex, then the *capacity*, $\mathcal{B}$, would tend to become a *probability*.

This is similarly true for $\mathcal{A}$.

Convergence of beliefs –

3 events, *A*, *B* ,*C*

Unit simplex



In this case, conventional beliefs are so strong that the *capacity*, $\mathcal{B}$, virtually becomes a *probability*.

This is similarly true for $\mathcal{A}$ (i.e., if $\mathcal{A}$ were to shrink to a singularity, it would act like a probability, too).

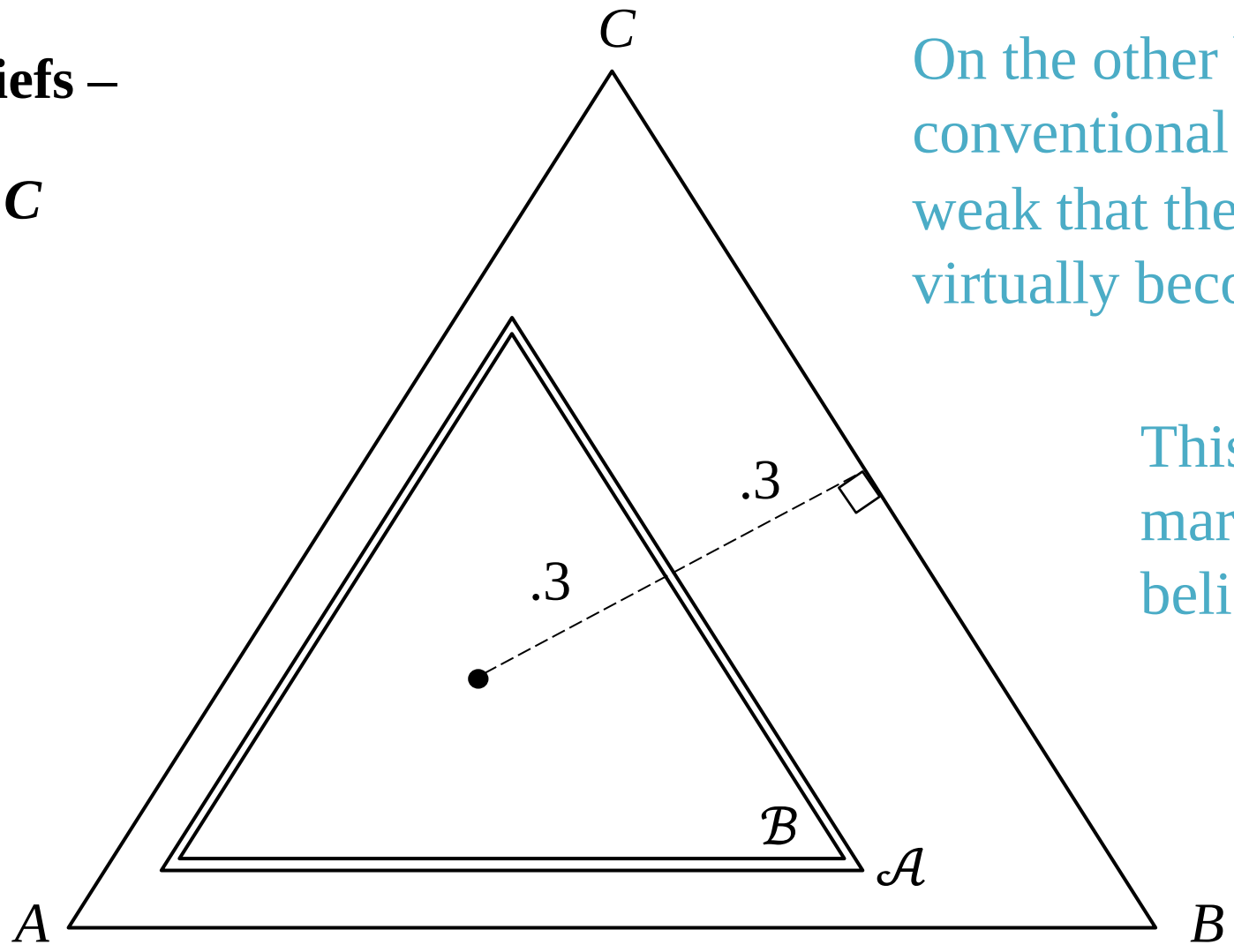
In either case, there is no room for subjective beliefs within the convention – all members of the convention hold, not just ‘similar’ beliefs, but identical beliefs.

2

Dilation of beliefs –

3 events, *A*, *B* ,*C*

Unit simplex



On the other hand, conventional beliefs can be so weak that the *capacity*, $\mathcal{B}$, virtually becomes capacity $\mathcal{A}$.

This means that marginal consensus beliefs are virtually 0.

In this case, there is no consensus about anything other than what Science tells us unambiguously.

2

Beliefs as capabilities

$\nu: \mathcal{F} \to \mathbb{E}_3$: i.e., $\nu(A) = (a, a + b, a + b + c)(A) = (\mathcal{A}, \mathcal{B}, \mathcal{C})(A)$

1. $\nu(A) \geq 0 \quad \forall A \in \mathcal{F}$
2. $\nu(\Omega) = 1$
3. $\nu(A \cup B) \geq \nu(A) + \nu(B)$ when $A \cap B = \emptyset$
4. $\nu(\emptyset) = 0$

ν simply bundles the 3 kinds of beliefs into a single (3-vector) mapping.

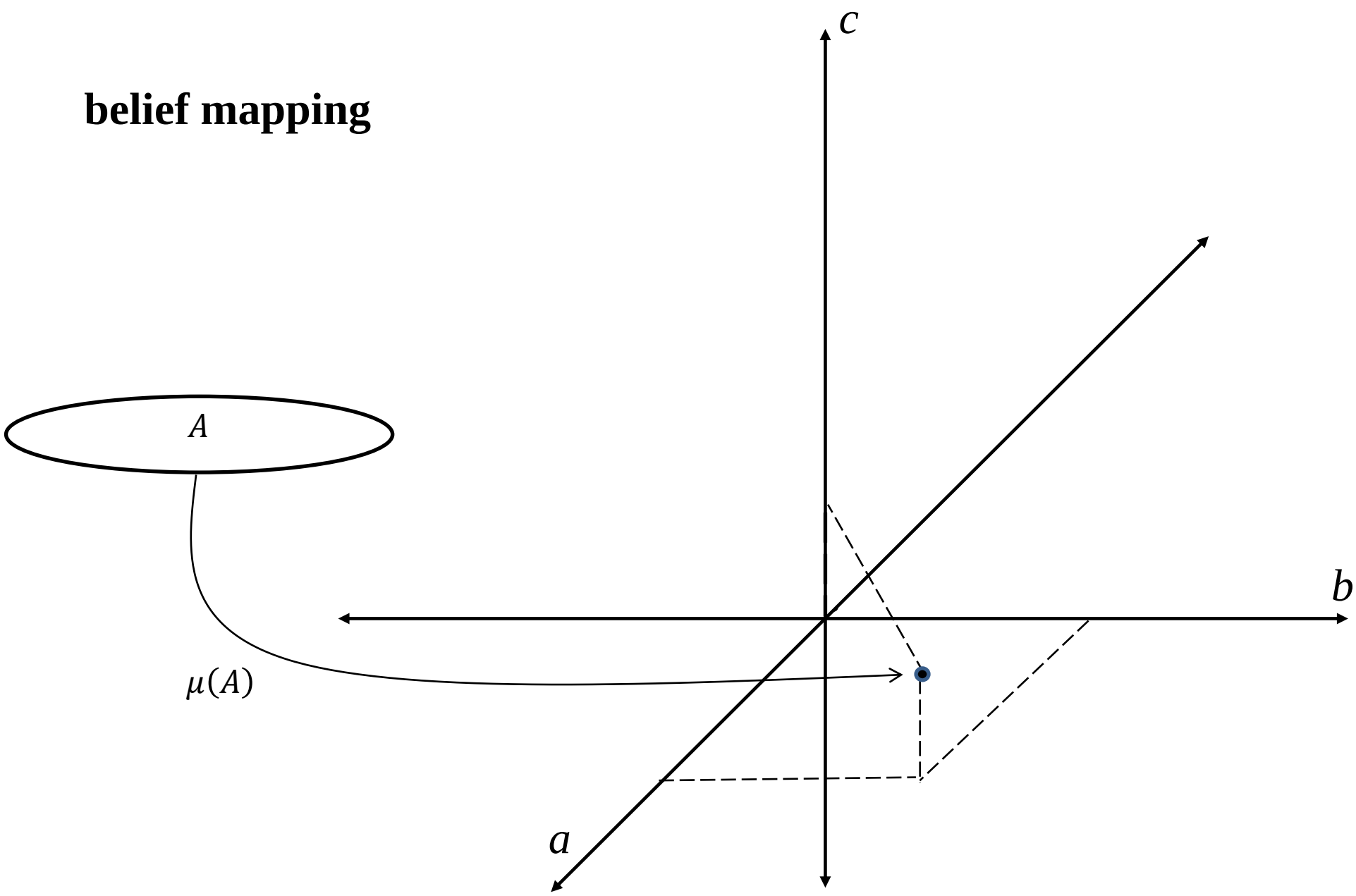
2

Beliefs as capabilities

$\mu: \mathcal{F} \to \mathbb{E}_3$: i.e., $\mu(A) = (a, b, c)(A)$

1. $\mu(A) \geq 0 \quad \forall A \in \mathcal{F}$
2. $\mu(\Omega) = 1 \quad (\Rightarrow \lfloor \mu(\Omega) \rfloor = 1)$
3. $\lfloor \mu(A \cup B) \rfloor = \lfloor \mu(A) \rfloor + \lfloor \mu(B) \rfloor = \lfloor \mu(A) + \mu(B) \rfloor$ when $A \cap B = \emptyset$
4. $\mu(\emptyset) = 0 \quad (\Rightarrow \lfloor \mu(\emptyset) \rfloor = 0)$

belief mapping



2

Updating beliefs

$$\nu(A|B).\kappa_{A|B} = \frac{\nu(A \cap B)}{\nu(B)}$$

Updating beliefs is relatively straightforward.

1. $\nu(A|B) \geq 0 \quad \forall A, B \in \mathcal{F}$
2. $\nu(A|A) = 1$
3. $\nu(A \cup C|B) \geq \nu(A|B) + \nu(C|B)$ when $A \cap C = \emptyset$
4. $\nu(\emptyset|B) = 0$

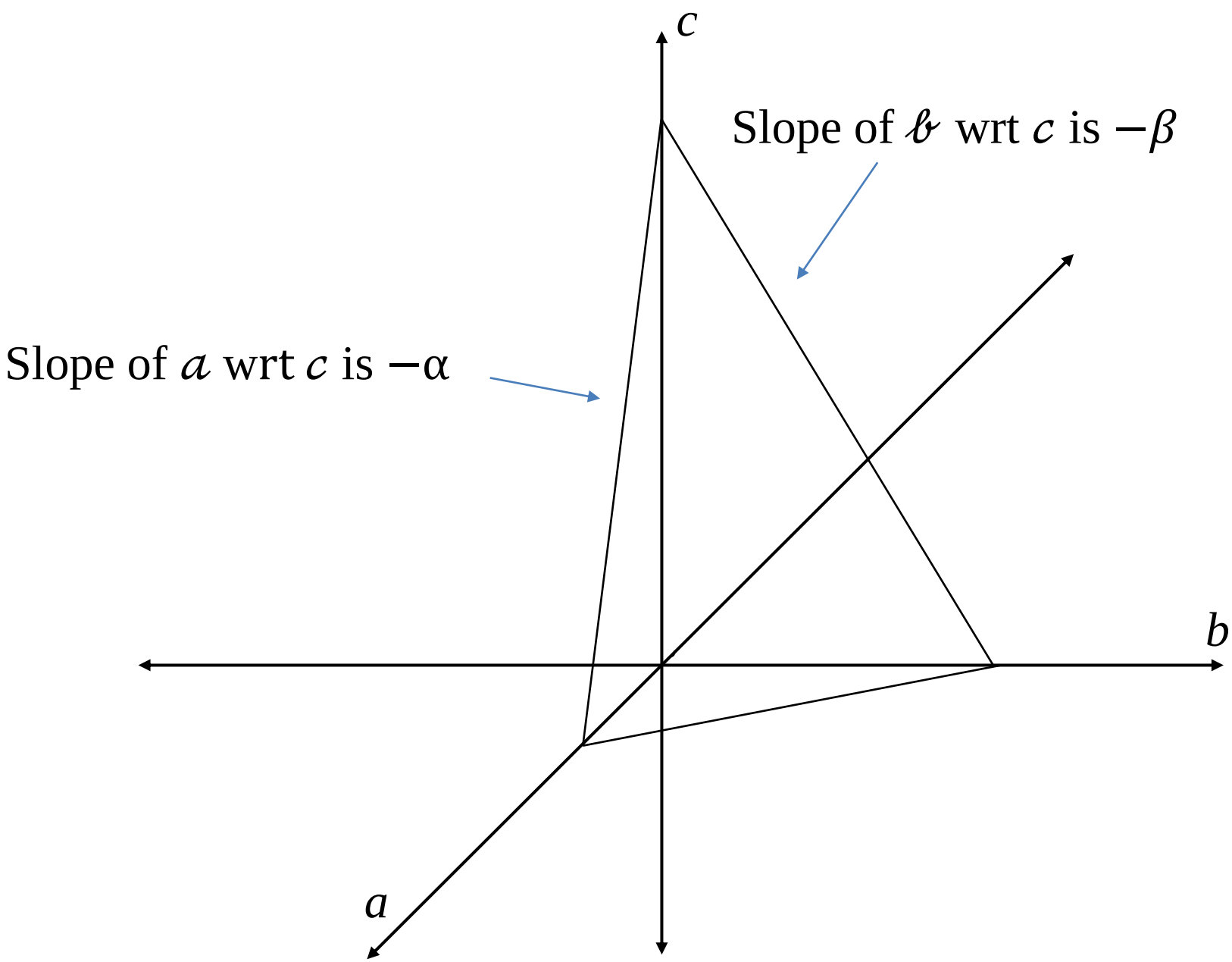
Preferences over beliefs

Given that people's beliefs can be decomposed into objective, consensus, and subjective beliefs, we should want to know what weight they attach to each.

To do this, we suppose there is a lottery of best and worst prizes (consequences) and we look at the preferences over lotteries that differ only by beliefs.

Since there are 3 kinds of belief, preferences can be expressed by 3-dimensional indifference surfaces (curves). It's convenient to suppose that the indifference surfaces are linear.

2



Objective beliefs are preferred to consensus beliefs are preferred to purely subjective beliefs – just as Keynes thought.

$\alpha \geq \beta \geq 1$

2

Maximizing utility

We show that individuals behave as if:

Choquet – or rank-dependent – expected utility in 3 dimensions

$$\max \; U = \varphi\left(\sum_{i=1}^{n} \mu(X_i) \cdot \left(u(\boldsymbol{x_i}) - u(\boldsymbol{x_{i-1}})\right)\right)$$

Inside the bracket is a 3-vector (as μ embodies the 3 dimensions of belief); φ operates on the 3-vector and returns a scalar. Hence, U is a real-valued number, as per usual.

2

Maximizing utility

The above expression decomposes into its constituent parts:

$$\sum_{i=1}^{n} \lfloor \mu(X_i) \rfloor \cdot \left(u(\boldsymbol{x_i}) - u(\boldsymbol{x_{i-1}})\right) + (\alpha - \beta) \sum_{i=1}^{n} \mathcal{A}(X_i) \cdot \left(u(\boldsymbol{x_i}) - u(\boldsymbol{x_{i-1}})\right) +$$

$$(\beta - 1) \sum_{i=1}^{n} \mathcal{B}(X_i) \cdot \left(u(\boldsymbol{x_i}) - u(\boldsymbol{x_{i-1}})\right)$$

2

Maximizing utility

Which happily has a more convenient form:

$$\max \mathrm{V(x)} = \mathbf{E}[u(x)] + (\alpha - \beta)\mathbf{E}_{\mathcal{A}}[u(x)] + (\beta - 1)\mathbf{E}_{\mathcal{B}}[u(x)]$$

Choquet expected utility using only objective beliefs.

Expected utility using objective, conventional and subjective beliefs.

Choquet expected utility using objective *and* conventional beliefs.

2

Maximizing utility

There are some interesting special cases:

For Savage Bayesians we have either or both of the following:

1. All beliefs are equally valued: $\alpha = \beta = 1 \implies \max \mathrm{V(x)} = \mathbf{E}\lfloor u(x) \rfloor$
2. There are only subjective beliefs: $\mathbf{E}_{\mathcal{A}} = \mathbf{E}_{\mathcal{B}} = 0 \implies \max \mathrm{V(x)} = \mathbf{E}\lfloor u(x) \rfloor$

3

Black swans

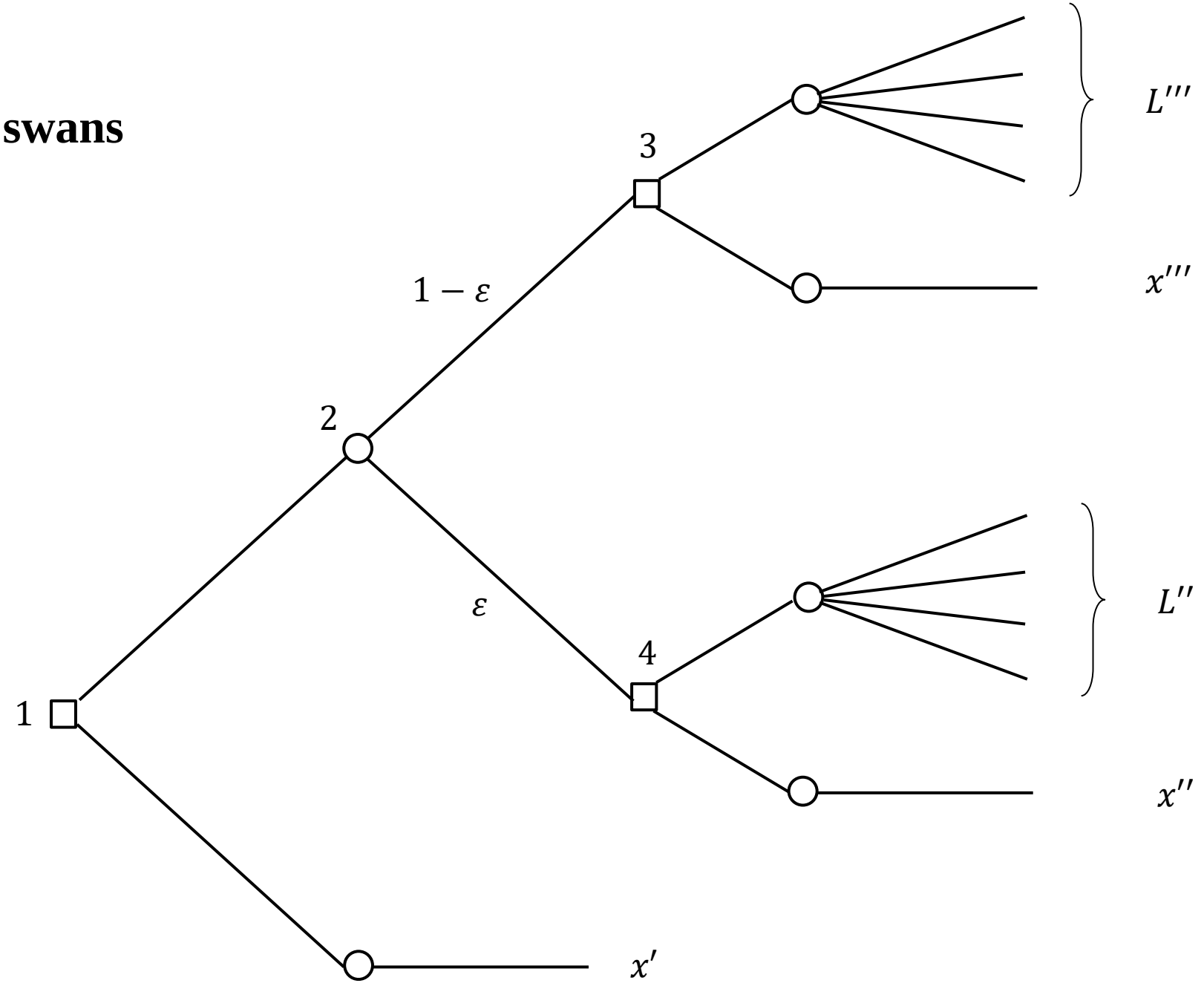
Suppose that consensus and objective beliefs are equally valued, and both are valued much more highly than purely subjective beliefs, i.e.:

$$\alpha = \beta \gg 1$$

The maximand is then:

$$\max \ \mathrm{V}(\mathrm{x}) = \mathbf{E}[u(x)] + (\beta - 1)\mathbf{E}_{\boldsymbol{B}}[u(x)]$$

Black swans



3

Black swans

- 3 decision nodes: [1], [3], and [4]
- 6 chance nodes
- node (2) leads to decision node [4] with objective probability ε (ε small), and it leads to node [3] with objective probability $1-\varepsilon$. $\mu([3,4] \mid [2]) = ((1-\varepsilon, \varepsilon), 0, 0)$
- The probabilities that define lottery L''' at node [3] are all objective.
- The capabilities that define lottery L'' at node [4] are all subjective or objective, there are no marginal consensus beliefs.

3

Black swans

There are 2 important cases:

1. *On* the business-as-usual (BAU) path the conventions are so strong that they act like probabilities:

$$\mathbf{E}[u(x)] \approx \mathbf{E}_{\boldsymbol{B}}\,[u(x)]$$

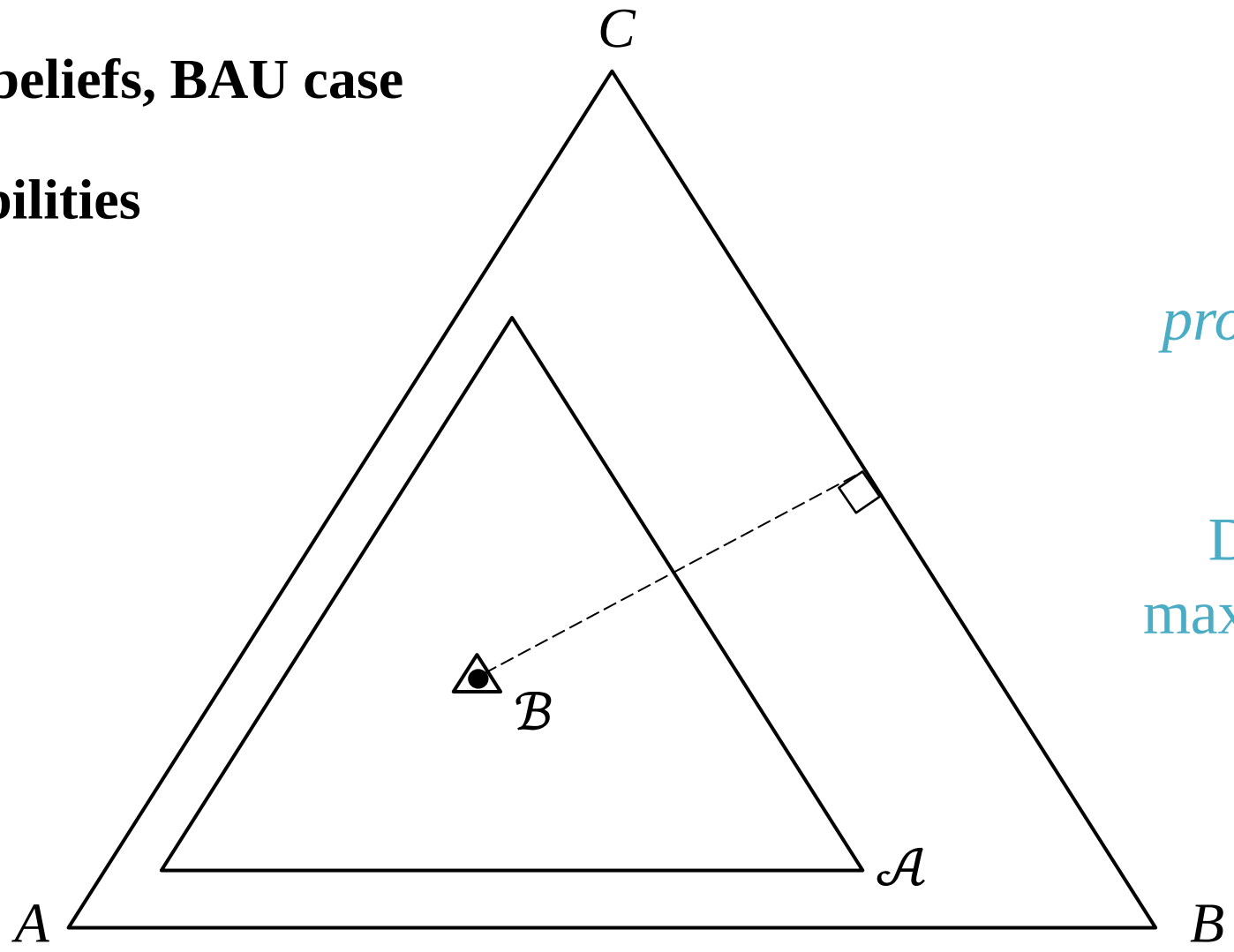
In this case, the maximand is:

$$\max\ \mathrm{V(x)} \approx \mathbf{E}[u(x)]$$

That is, people *almost surely* maximize expected utility.

Conventional beliefs, BAU case

Almost probabilities



Conventional beliefs are *probability-like* on the BAU path.

Decision makers maximize expected utility just as standard theory says.

3

Black swans

There are 2 important cases:

2. *Off* the business-as-usual path, consensus collapses, there no marginal consensus beliefs:

$$\mathbf{E}_{\mathcal{A}} = \mathbf{E}_{\mathcal{B}} > 0 \implies \max \mathrm{V(x)} = \mathbf{E}[u(x)] + (\beta - 1)\mathbf{E}_{\mathcal{B}}[u(x)]$$

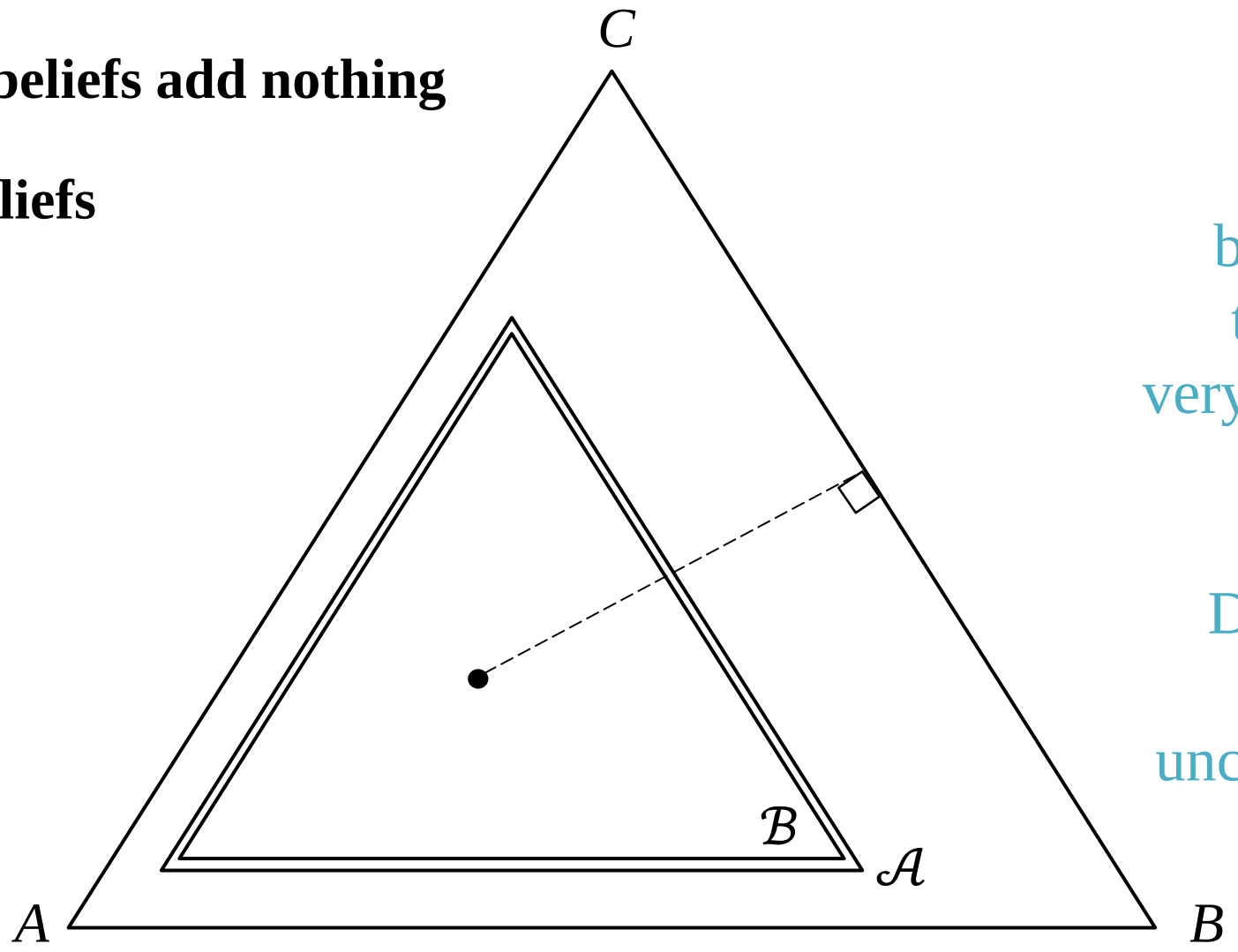
If $\beta \to \infty$, the maximand is:

$$\max \mathrm{V(x)} \approx \mathbf{E}_{\mathcal{B}}[u(x)]$$

That is, decision makers act *as if* they were highly uncertainty-averse CEU maximizers

Conventional beliefs add nothing

to objective beliefs



Conventional beliefs *dilate* off the BAU path – very *un*-probability like.

Decision makers become very uncertainty averse.

3

Black swans

In our model:

- no expectational errors are made – expectations are ‘rational’
- no one ‘panics’ – the decision maker is rational throughout

Yet:

- The decision maker flips from expected utility maximization on the BAU path to…
- Highly ambiguity-averse CEU-maximization in the event of a Black Swan

3

Black swans

Note that the model will bear the interpretation that, in the event of a Black Swan, the decision maker has an extremely high demand for liquidity on account of her ambiguity averse behaviour – she demands assets that hold their value even in the case of uncertainty.

3

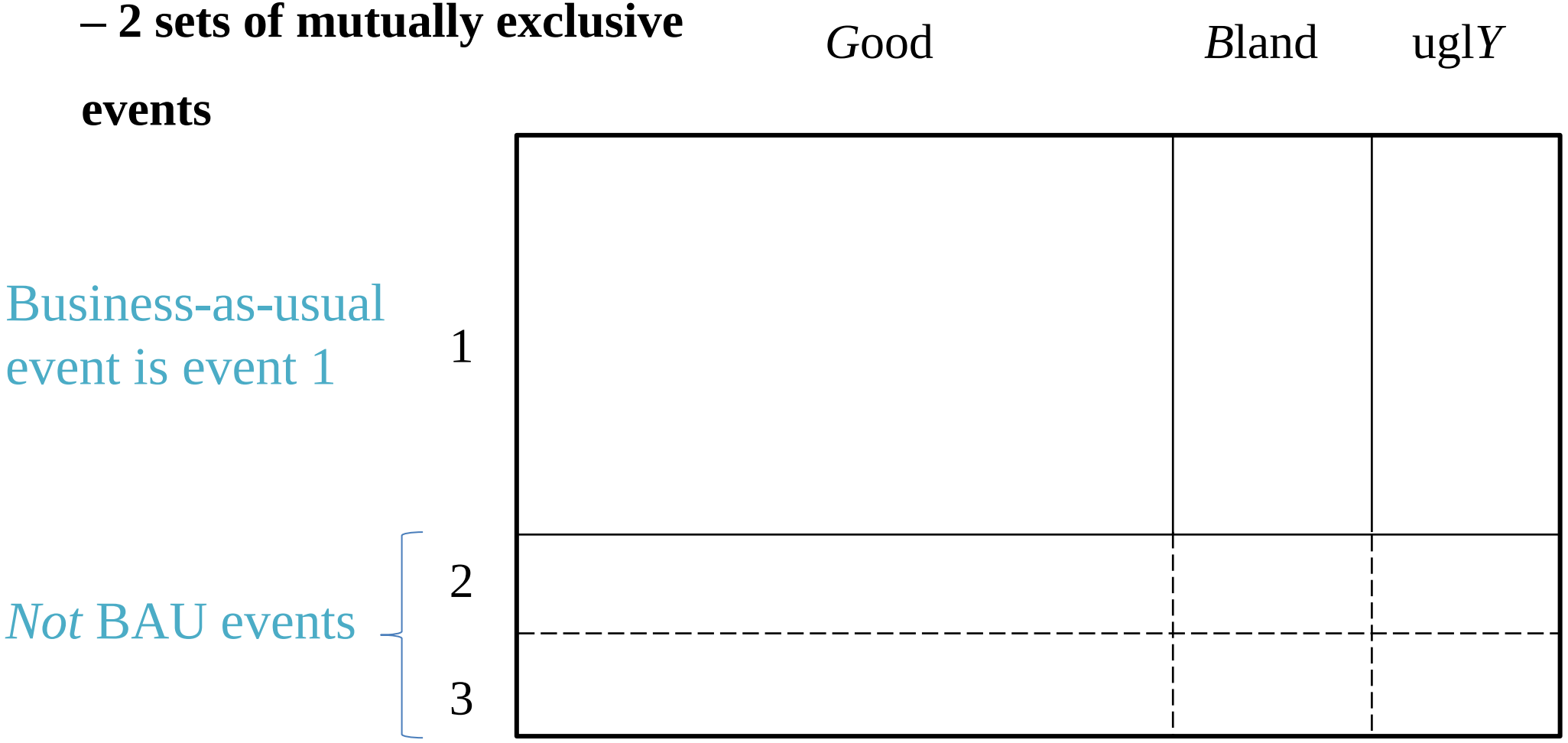
The Good, the Bad, and the uglY

In the Black Swan example, we showed how an individual will behave off the BAU-path if there are no strong conventions off that path.

We next explain *why* conventions might collapse off the BAU-path.

The Good, the Bad, and the uglY

– 2 sets of mutually exclusive events



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The Good, the Bad, and the uglY

In the above scenario, we are initially told whether events 1 or 2-or-3 has occurred, and we are subsequently informed of the final state (i.e, if 1 has occurred initially, we are told whether *G*, *B*, or *Y* has occurred subsequently; and if 2-or-3 has occurred initially, we are told whether 2*G*, 2*B*, 2*Y*, 3*G*, 3*B*, or 3*Y* has occurred subsequently).

There are strong consensus beliefs over event 1 and between events 1 and 2-or-3.

However, should either event 2 or 3 occur, there are no conventional beliefs at all over the sub-events.

3

The following marginal conventional beliefs are all strictly positive:

$$\mathscr{b}(1),\mathscr{b}(2 \cup 3),\mathscr{b}(1G),\mathscr{b}(1B),\mathscr{b}(1Y) > 0$$

But the following marginal conventional beliefs are all zero (*ex hypothesi*):

$$\mathscr{b}(2),\mathscr{b}(2G),\mathscr{b}(2B),\mathscr{b}(2Y),\mathscr{b}(3),\mathscr{b}(3G),\mathscr{b}(3B),\mathscr{b}(3Y) = 0$$

Given the updating rule, we therefore have:

$\mathcal{B}(A) > \mathcal{B}(A|C)$ for all $A = G, B, Y$; $C = 2,3$.

Beliefs have dilated

The Good, the Bad, and the uglY

As the following diagram shows, there is a consensus based on prior beliefs that event 1 is very likely. All decision makers agree on that point and form a consensus around that view. If event 1 occurs, that consensus is maintained. Demand for money is low in event 1.

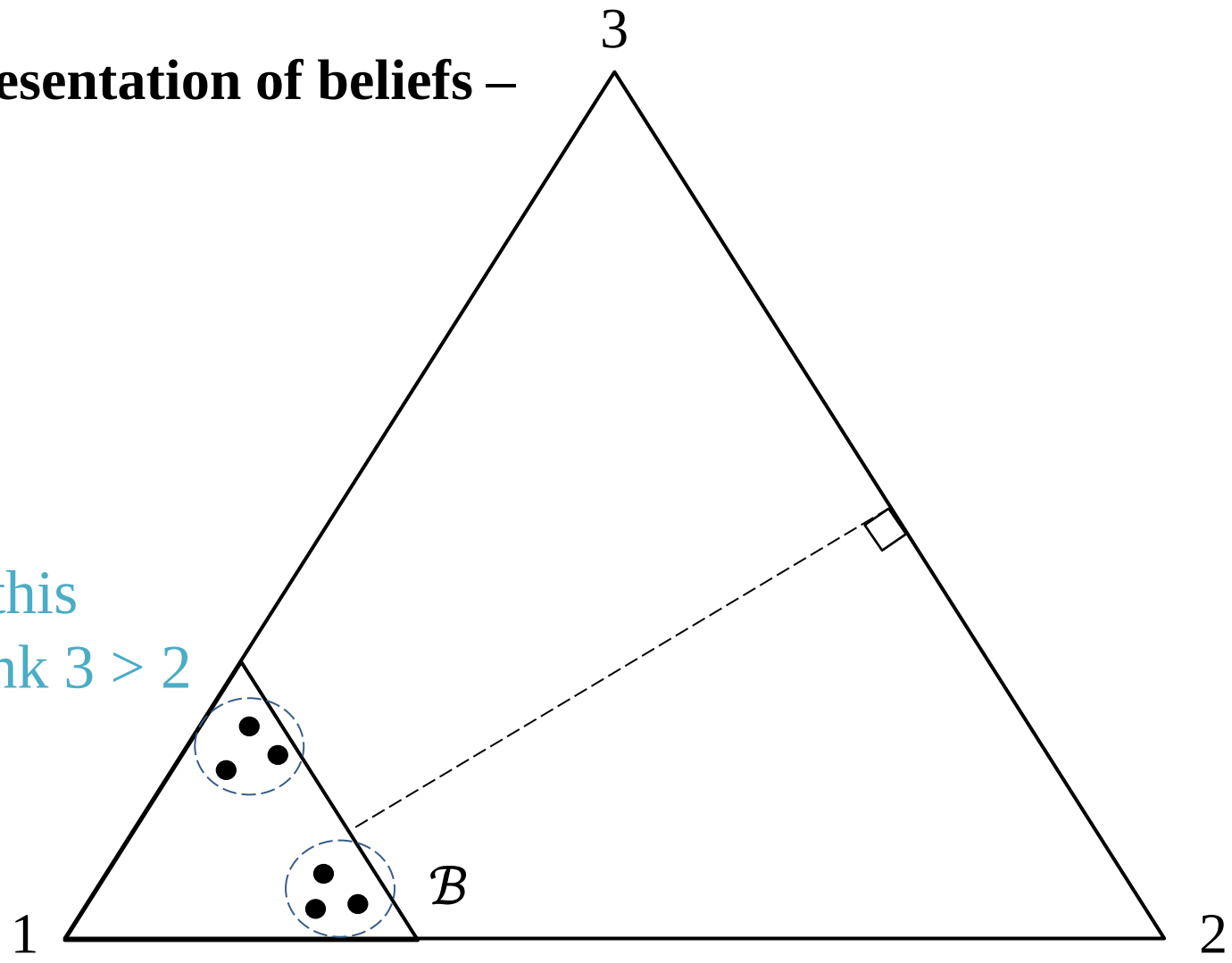
However, should event 1 *not* occur, there are *no* conventional beliefs at all over whether event 2 or 3 is the more likely to occur.

And, moreover, that there is no consensus *within* each shown cluster as to whether *G* or *B* or *Y* is more likely to occur in the event of either 2 or 3.

3

graphical representation of beliefs –

3 events, 1,2,3



3

The Good, the Bad, and the uglY

The upshot is that: outside of event 1, there is no consensus to support beliefs as to which state of affairs is more likely to come about.

In those circumstances, decision makers have strong demand for liquid assets; i.e., assets that retain their value no matter what happens.

4

Conclusion 1:

There is substantial and substantive agreement with King and Keynes on uncertainty and the role of money, but mathematics can go some way to model non-probabilistic beliefs.

4

Conclusion 2:

The fundamental role of central banks isn’t to apply mechanical rules—like the Taylor Rule, or monetarist rules—but is to assist in the creation of conventional beliefs that sustain monetized economic activity.

Conclusion 3:

A key conventional belief that the central bank tries to effectuate is that the value of money is lower bounded, which assists in sustaining economic activity under uncertainty.