Black Swan Events

Popular misconceptions

Contents

- Something about Rio Tinto

- Even less about me

- Definition of Black Swan events (the truth)

- Aggregated risk (coincident, related, interconnected)

- Some high profile high impact risks

- How should we think about high impact risks?

- Discussion

Something about Rio Tinto

- Leading international FTSE100 mining group

- Dual listed in the UK (LSE) and Rio Tinto Limited on the ASX. Also NYSE listed entities.

- Our business is finding, mining, and processing mineral resources.

- Main products – aluminium, copper, diamonds, energy (coal and uranium), gold, industrial minerals (borax, titanium dioxide, salt, talc) and iron ore.

- Worldwide but strong in Australia, N Am and Africa, but significant in S Am, Asia, and Europe.

- Half year to end June 2011: net earnings of $7.8 billion, and capital expenditure of $5.1 billion.

- Market capitalisation (early Jan) £64 billion (FTSE top 10)

Even less about me

- John Summers

- Chief Risk Advisor at Rio Tinto in London.

- Member of the IRM.

- Part of a corporate team of 12 professionals in UK and Australia.

- Worked in risk for many years.

- Trained as a Rock Engineer, and hold an MSc.

The true definition of Black Swan events

The theory was developed by Nassim Nicholas Taleb in his book.

A Black Swan **must** have the following three attributes.

1. It is an outlier, beyond the realm of regular expectations, because experience can't point to its possibility.

2. It carries an extreme impact.

3. After the fact we produce explanations for its occurrence, making it explainable and predictable.

- In summary: rarity, extreme impact, and retrospective predictability.

- The black swan theory is a metaphor that: *The event is a surprise (to the observer) and has a major impact. After the fact, the event is explained.*

Summary

- Identifying a black swan event

  - The event is a surprise (to the observer).

  - The event has a major impact.

  - The event is rationalized by hindsight, as if it could have been expected (e.g., the relevant data were available but not accounted for).

- <u>Note</u> that the event must be a surprise to the observer.

- Hillson subdivides Rumsfeld's ***unknown-unknowns****:*

  - *unknown-but-knowable unknowns*; that we could find out

  - *unknown-but-unknowable unknowns*; the true black swans

RioTinto

Aggregated risk (coincident, related, interconnected)

Aggregated risk includes coincident, related, or interconnected risk

- *Coincident*: two risks eventuate simultaneously but from unrelated causes

- *Related*: two risks eventuate due to a common cause

Aggregated risks often result in large impacts and are, therefore, incorrectly defined as Black Swans.

More recent developments are in understanding the connectivity between risks. This work is emerging from the insurance sector

- *Interconnected*: risks related by their genetic characteristics

Risk Connectivity

Input
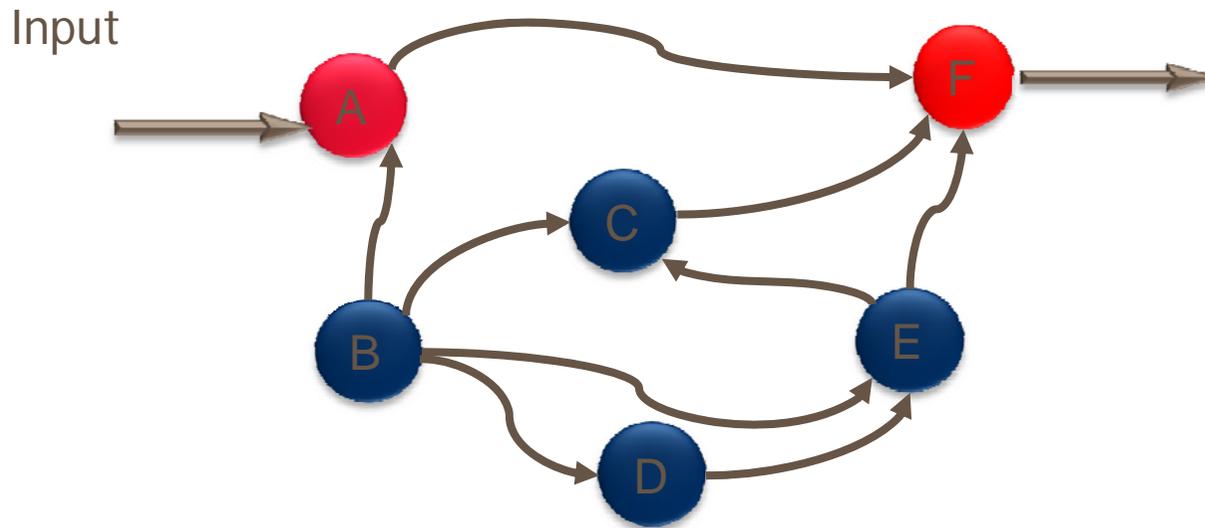
The above is an illustration of risks and how they are connected. By understanding the connection between risks we can answer questions such like

➢ If risk A occurs does it make risk F more or less likely?

➢ If risk B occurs what effect does it have on Risk A,C,D,E & F?

Answering questions such as these allows us to plan a strategy and decide where to focus our risk management effort.

Some high profile high impact risks

Consider some of the high impact events that have occurred and become major press events, which (if any) were true Black Swans?

	Out.	Maj.	Rtn'd
★ Chernobyl nuclear disaster (1986) – safety systems shut down for a technical exercise on the turbine generator	✗	✓	✓
★ Flixborough Disaster (1974) – cyclohexane leak and explosion	✗	✓	✓
★ Chilean miners trapped underground (2010) – co-located emergency egress	✗	✓	✓
★ World trade centre (2011) – terrorist activity	✗	✓	?
★ Tacoma Narrows bridge collapse (1940) – collapsed in moderate shear wind by a process called "aeroelastic flutter"	✓	✓	✓
★ Buncefield oil storage depot explosion (2005) – undetected fuel leak and explosion	✗	✓	✓
★ Texas City oil refinery explosion (2005) – a vapour cloud accumulation resulting in an explosion	✗	✓	✓

How should we think about high impact risks? (1)

- Low probability / high consequence risks can result from a number of causes

    - how can we improve our ability to identify and manage these risks?

- Are true black swan events beyond our ability to identify and manage?

Considerations

- Think the unthinkable – how bad might it actually be? (e.g. twin towers)

- Focus on impact at Board level not on probability weighted impact

- Scenario identification – what combination of events might occur?

- Horizon scanning – what is happening to others?

- Broader, more creative risk identification

- Risks that might be known by others (black swan to us)

How should we think about high impact risks? (2)

Considerations cont:

- Risk management is largely contingency planning e.g. for earthquakes

  - Resilient business continuity (expect the unexpected)

- Reverse stress testing

- Related causes (linked bow tie diagrams)

Finally:

- Apply Noah's rule

Discussion