The Optimal Timing of Risk Management

2016 ERM Symposium

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April 2016

Agenda

1. When does timing matter?
2. Timing Decision Biases
3. NPV vs Real Option
4. Risk Management Timing Consideration
5. Example: Financial Risk Hedging
6. Recap

When Does Timing Matter?

When Does Timing Matter?

It is an easy question for investment.

- Buy low and sell high.
- Predict the cycles of assets (stock, real estate, commodity, etc.)

Less popular for risk management.

- Most risk management projects are driven by regulators, rating agencies, financial crisis and catastrophes.
- Passive market players usually follow peers.

Timing consideration is important when

- It is not an immediate requirement.
- The outcome of the implementation is less predictable.

Cost & Benefit Analysis is Difficult

Benefits

- Expected Return?
- Less Volatility?
- Milder Adverse Result?

Cost

- Hedging cost?
- Loss of upside gains because of hedging?

Risk Management Timing

Projects

- seen to optimize the risk profile
- used to prepare for extreme situations in the future
- allow for deferral of implementation

Time to Raise Capital	Time to Hedge IR/EQ Risk
Time to Transfer Excessive Insurance Risk	Time to Build More Advanced Risk Modeling Platforms

Timing Decision Biases

Biases in Timing Decision

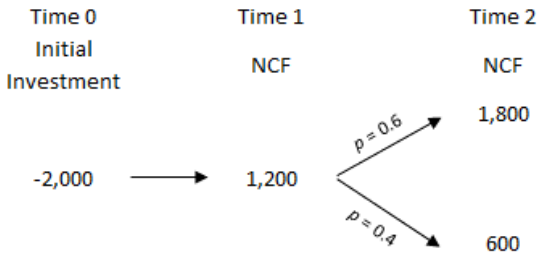
- Herding
- Analysis Paralysis
- Shortsighted Shortcuts
- Shooting from the Hip

NPV vs. Real Option

Net Present Value Approach

$$NPV = \sum_{t=1}^{n} \frac{NCF_t}{(1+k)^t} - C_0$$

Option 1: Start the project immediately with a 2-year time horizon.

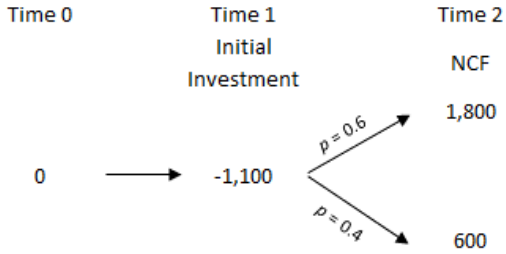


NPV of Option 1 = $165 (Discount rate: 10%)

Net Present Value Approach

$$NPV = \sum_{t=1}^{n} \frac{NCF_t}{(1+k)^t} - C_0$$

Option 2: Start the project 1 year later with a 1-year time horizon.



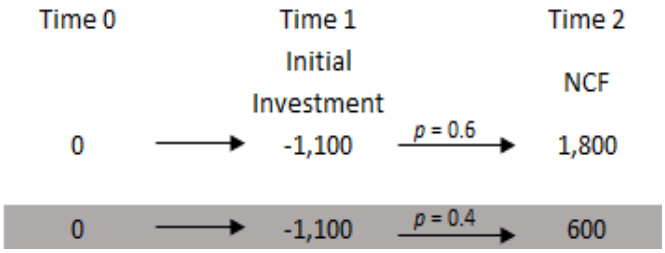
NPV of Option 2 = $83

Real Option Approach

Real option approach incorporates the value of future information in the decision-making process.

Option 1: Same as NPV approach. (Value = $165)

Option 2: The value of NCF at time 2 will be known at time 1. (Value = $\left(\frac{1800}{1.1^2} - \frac{1100}{1.1}\right) \times 0.6$ $266)



Risk Management Timing Considerations

Cost and Benefit

Cost	Benefit
Project Investment	Loss reduction at a given confidence level
Hedging Cost	Potential lower borrowing cost
Transaction Cost	Potential lower cost of capital
Counterparty Risk	Better Decision
The Loss of Upside Gains	

Difficulties

Value of future information is difficult to quantify (Change of phases in a cycle)

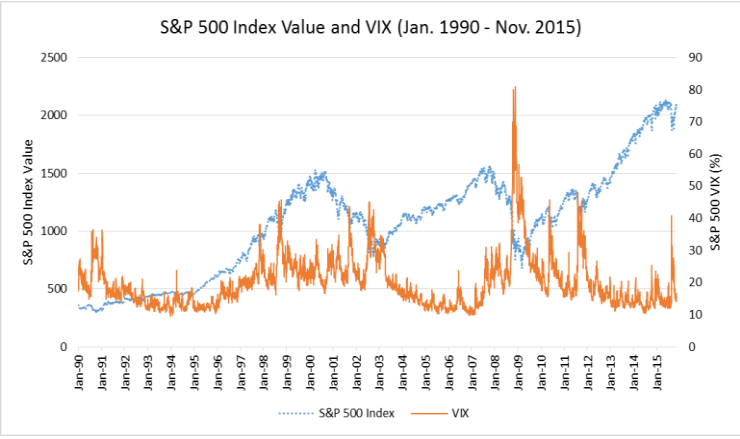
Divisible project timing decisions involve both timing and amount of investment at each stage.

Example: Financial Risk Hedging

Financial Risk Hedging

1. High hedging cost in economic recession and low cost in economic expansion.
2. Contrarian approach for companies with free capital.
3. Focusing on short-term earnings volatility in a distressed situation.
4. Key consideration: Future change of economic conditions.

Equity Risk Hedging



Source: Yahoo! Finance

Equity Index Option to hedge equity risk.

The cost of hedging (option price) is affected by VIX, interest rate, etc.

For simplicity, we only consider VIX changes in this timing decision.

VIX Experience

3-month Transition Matrix of VIX (Jan. 1990 – Nov. 2015)

VIX	<10%	[10%, 20%)	[20%, 30%)	[30%, 40%)	[40%, 50%)	≥50%
<10%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%
[10%, 20%)	0.3%	84.0%	12.6%	2.6%	0.5%	0.1%
[20%, 30%)	0.0%	29.5%	57.6%	9.7%	1.1%	2.1%
[30%, 40%)	0.0%	10.7%	68.5%	16.6%	3.4%	0.7%
[40%, 50%)	0.0%	0.0%	47.3%	39.3%	13.4%	0.0%
≥50%	0.0%	0.0%	1.8%	16.1%	71.4%	10.7%

Low volatility range (VIX <20%)

Middle volatility range (VIX ϵ [20%, 30%])

High volatility range (VIX> 30%)

Timing Decision

Decision to make: Implement the hedging immediately or defer the decision for 3 months

Low VIX: cost is low and is likely to implement immediately

High VIX: cost is high and may wait for 3 months for lower VIX

Medium VIX:

- If heading into recession, implement immediately
- If heading into expansion, defer the decision

Option 1: Hedging immediately

Time 0			12 Months		
Cost of Put Option	Equity Value		Equity Value [1]	Put Option Payment [2]	Reduced Cost of Capital [3]
			$57.2M	0	$1.3M
$3.8M	$50M	p = 0.33, p = 0.49, p = 0.18	$50.8M	0	$1.3M
			$41M	$9M	$1.3M

Cost: $3.8M

Benefit: $9M×0.18 + $1.3M

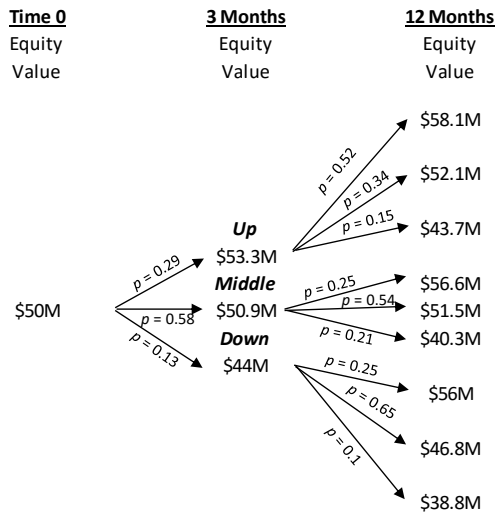
NPV: -$1.1M

Option 2: Deferring the hedging decision for 3 months.

VIX prediction based on historical experience:

Time 0		3 Months	
Volatilty		Volatility[1]	Cost of Put Option[2]
		18%	$1.2M
25%	p = 0.29, p = 0.58, p = 0.13	24%	$2.9M
		39%	$5.8M

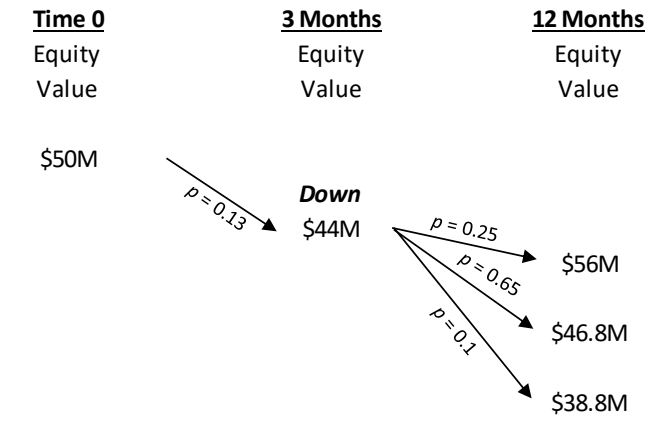
Option 2: Deferring the hedging decision for 3 months.



Scenario	Up	Middle	Down
NPV@10%	0.45	0.04	-5.20
ROI	70%	12%	-96%
Probability	29%	58%	13%
Time	Cash Flows		
0	0	0	0
0.25	-1.20	-2.90	-5.80
1	1.78	3.16	0.51
Decision	Hedge	Hedge	No

Option 2: Deferring the hedging decision for 3 months.

Will not hedge in the down scenario, but with extra cost of the unhedged position in the down scenario: ($50M - $46.8M) × 0.65 + ($50M - $38.8M) × 0.1 = $3.2M



NPV of Option 2: $-0.2M

Better wait for 3 months

Other Examples

Two other examples in the paper:

1. Timing of hedging insurance risk (Underwriting cycle)
2. Timing of risk management investment (EC framework)

Recap

Recap

- The timing of a risk management project could have a material impact on the cost, such as the hedging cost of a hedging program or the cost of capital in a financing plan.
- Timing of implementing a risk management strategy or starting an investment in new risk management functions is important.
- Real option approach can be adjusted and used for timing decisions on risk management projects.
- The cost and benefit of a risk management project are different from a traditional investment.
- Assessing the value of future new information and their impact on future decisions is the key to timing decisions for risk management projects.

Q&A

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