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Project Not Feasible? Not so fast! A Black-Scholes perspective.

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Many projects are discarded at the initial appraisal stage for lack of a business case. Following the application of initial screening techniques as the NPV or the discounted payback period, projects exhibiting an unduly long payback period or a negative NPV are deemed as lacking a business case and are therefore never undertaken. This, however, is often times a premature decision or even the wrong decision or both.

Taking into account real options, entrepreneurs can apply the principles contained in the Black-Scholes options pricing model to better inform their investment decisions. Real options refer to the ability (the right but not the obligation) for a company to undertake a certain business initiative but have the option to

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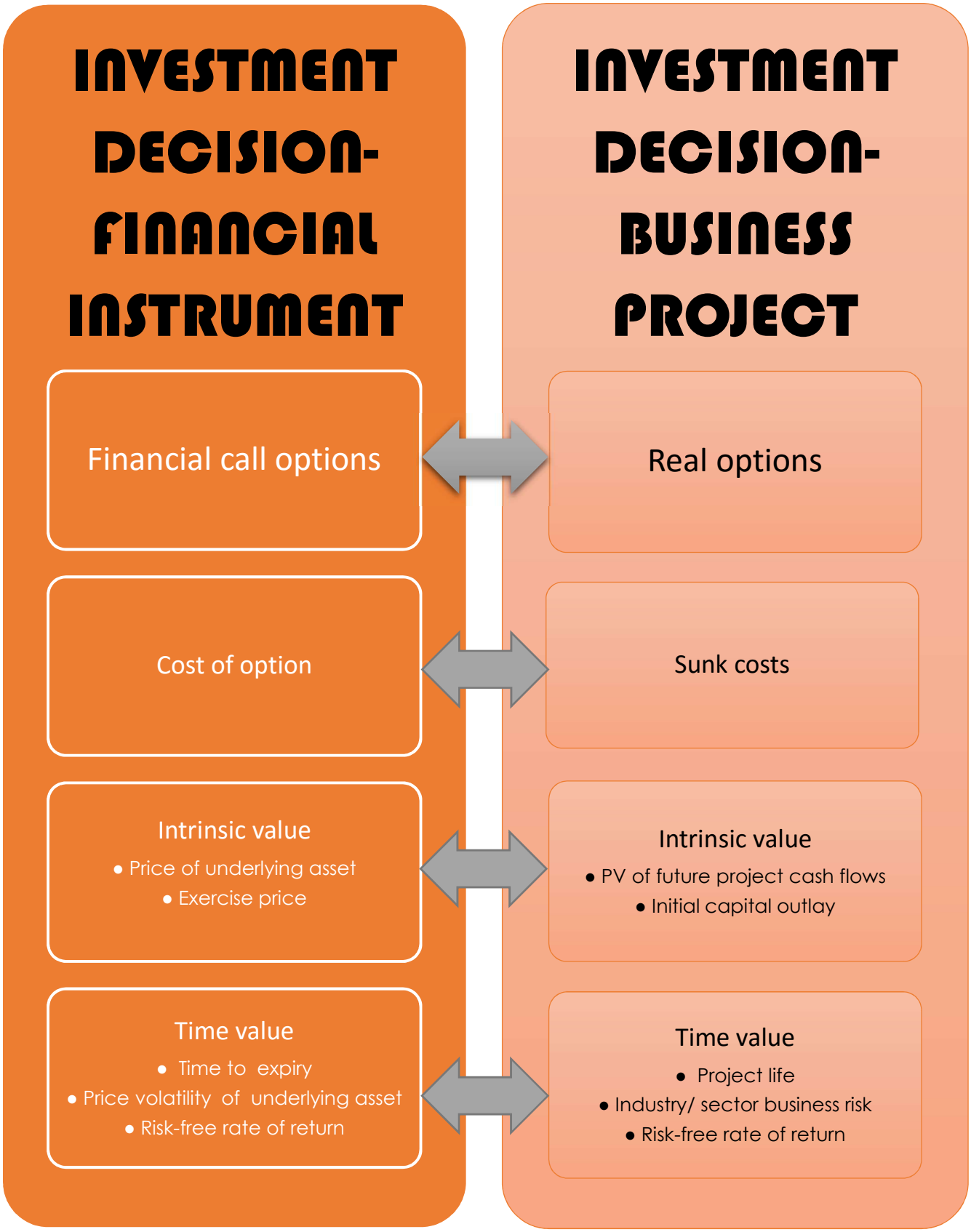
- **R**- Redeploy or switch
- **E**- Expand or contract
- **A**- Abandon or stagger
- **D**- Delay or defer

the investment or resources. Just like with a typical finance option, the Black-Scholes options pricing model principles can equally be applied to real options as follows:


INVESTMENT DECISION- FINANCIAL INSTRUMENT
INVESTMENT DECISION- BUSINESS PROJECT
Financial call options
Real options
Cost of option
Sunk costs
Intrinsic value
• Price of underlying asset
• Exercise price
Intrinsic value
• PV of future project cash flows
• Initial capital outlay
Time value
• Time to expiry
• Price volatility of underlying asset
• Risk-free rate of return
Time value
• Project life
• Industry/ sector business risk
• Risk-free rate of return

A financial investor will need to incur the initial cost of purchasing the option instrument in order to position himself to benefit from any price rise in the underlying asset above the exercise price. Likewise, the 'real economy' investor will need to incur sunk costs (survey, marketing, R&D costs etc) in order to position himself to take advantage of changing market conditions. This 'sunk cost' effort will provide crucial information that will allow him to choose to either **r**edeploy, **e**xpand, **a**bandon or **d**elay project (resources) to ensure a positive net return.

Thus, real options provide the entrepreneur with the flexibility to apply a number of options to his investment decision-making. He can effectively minimise his downside risk (R.E.A.D the project or firm resources) while keeping alive upside potential in the event market conditions improve.

In effect where the PV of future cashflows are expected to exceed initial investment cost the investor is placing a call option on the future investment.

The advantages accorded the entrepreneur as a result of this flexibility are therefore typically ignored when appraising the viability of projects using traditional methods like the NPV. Imbuing this flexibility (that effectively enhances optimal choices as to whether and/or when to invest) into the appraisal process should result in a reduction in the discount rate used to evaluate net investment value. This flexibility is analogous to the ability accorded the financial investor in waiting to see the direction and extent of the underlying asset price movement before exercising the option.

Note: Where a call option is out-of-the-money i.e having zero intrinsic value, this is no indication that the option has no value at all. Indeed, the instrument still carries value (i.e time value) as investors will expect a price rise in the underlying in the time to expiry of the option. Likewise, although an investment project may initially indicate a negative NPV (and hence undesirable), consideration of real options open to the company and the application of the Black-Scholes model to this reveal that discarding such a project outright may be somewhat premature. There does exist a time value in the project at $\mathbf{T_0}$ and it is this value that gives an otherwise non-viable project its positive value- the strategic NPV. For example, investing in a new manufacturing facility may **over time** provide a company with real options of introducing new products, consolidating operations or making other adjustments to changing market conditions.

The application of the concept of real options and the Black- Scholes options pricing model in finance can be especially invaluable when applied to M&A activity or joint ventures. Such application extends to the valuation of equity of the target company in an M&A transaction with the price of the call option acting as proxy to the value of equity in the target company.

Case study

A client retailer that has identified the opening of a shopping mall as undesirable following a negative Net Present Value evaluation of **minus KES 10 million** may need to reconsider this decision if it factors in the potential for growth and profitability **beyond** the first shopping mall. Market conditions may improve in the future and the client retailer needs to position itself for this eventuality. It may need to consider the following:

- **R**edeploying or switching resources from some of its other business ventures towards the shopping mall(s)
- **E**xpanding by investing in an additional mall(s)
- **A**bandoning construction of the new mall(s) where market conditions (will) deteriorate
- **D**elaying construction of the new mall(s) until market conditions improve

These real options available to the retailer give it a flexibility that needs to be factored into its current investment appraisal.

Initial market survey results provide the following details regarding the opening of a second mall.

Project planning horizon*- 5 years

Estimated cost (P_e)- KES 200m

Present value of net project receipts (P_a) - KES 150m

Volatility (standard deviation) of cash flows (measured by sector volatility of cash flows)- 30%

Risk-free rate of return- 10%

Applying the Black-Scholes options pricing model the **call option value** is equal to

$P_aN(d_1) - P_eN(d_2)e^{-rt}$ = **KES 52m**

This is the value of the real option of expanding into a second mall <u>but only if</u> the first mall is constructed.

Thus:

	KES in millions
Conventional NPV of the first mall	(10)
Value of the call option on the second mall	<u>52</u>
Strategic Net Present Value	**42**

Factors that could help build the positive strategic NPV *(KES 42m)* include a better-performing economy and therefore greater consumer and retail space demand, changing demographics, increased urbanisation, improved borrowing conditions (lower interest rates, improved collateral position of the retailer), government tax incentives, changing legislation- more relaxed planning laws, lower land prices, economies of scale, better administrative overhead allocation, etc

*This represents the period during which revenue is expected to grow. It ignores the period beyond the planning horizon during which revenue is expected to stagnate. Taking the period beyond the planning horizon into account could have a material effect on the strategic NPV evaluation.

At PK Mwangi Global Consulting we conduct project appraisal assignments and associated engagements for clients from small and medium-sized enterprises to corporations and non-governmental organisations.

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