Investing in change

Exploring the financial feasibility of convertible buildings

P5 Presentation

29th October 2024

Pina Koch

Why?

Introduction

Introduction

VS.

Potential solution…

Potential solution…

Building conversion

Potential solution…

Designing buildings for conversion

Designing buildings for conversion

However, not widely adopted as common practice.

Designing buildings for conversion

However, not widely adopted as common practice.
→ Uncertainty about financial feasibility

Although research has been conducted on the prerequisites and feasibility of convertible buildings, the financial feasibility of design of buildings with future conversion potential remains largely unexplored. This gap in knowledge influences investor decision-making and market adoption of convertible building designs.
Thus, this research seeks to determine how the design for conversion impacts the financial feasibility of new buildings.

How does the design of a new office building for future residential conversion affect its financial feasibility?

How does the design of a new office building for future residential conversion affect its financial feasibility?

1. How is the **financial feasibility** of a new office building evaluated?
2. How can an office building be **designed to enable future conversion** to residential use?
3. What are the **costs and benefits** of the design of a new office building for future residential conversion?
4. How do the costs and benefits of the design for residential conversion **affect the DCF model** of a new office building?

Scope

- Functional building conversion: office use to residential use
- Design for conversion as pro-active design strategy
- Convertibility as pre-configured ability of the building
- New buildings
- Excluding the conversion of “standard” buildings

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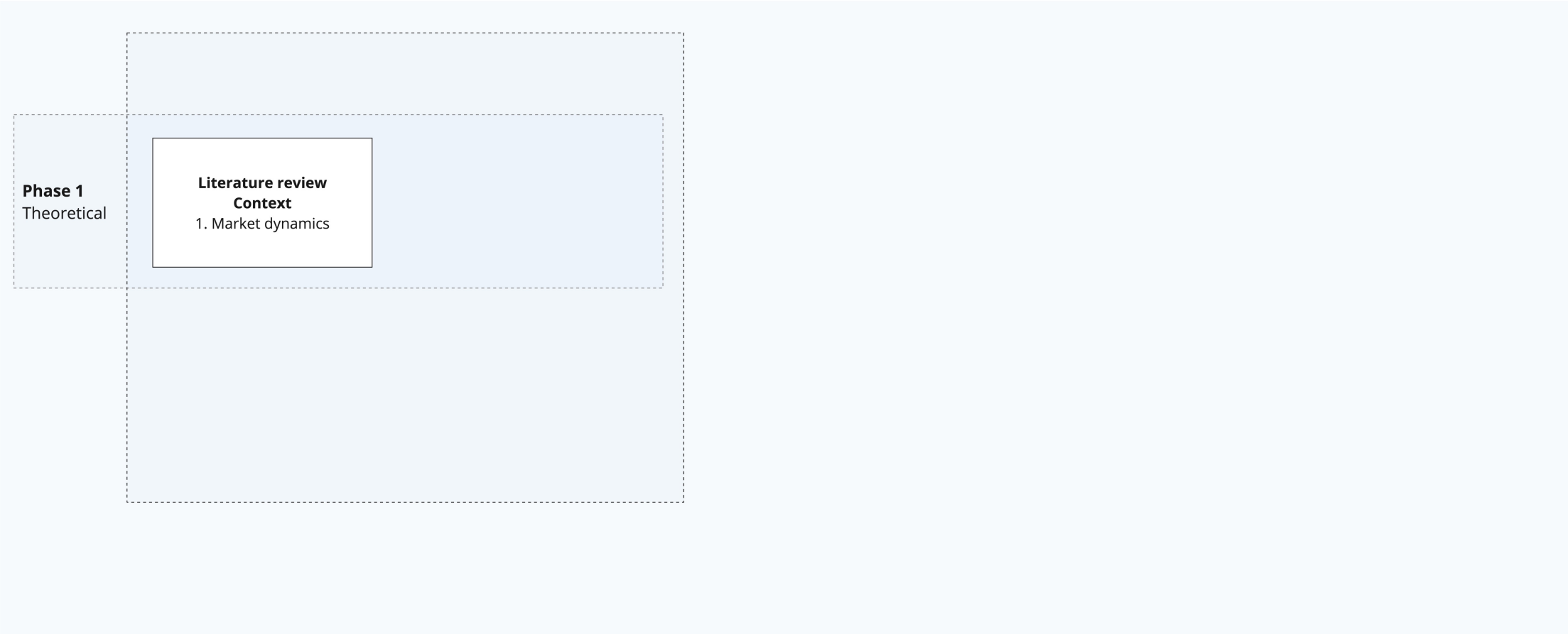
Methodology

Research design

Research design



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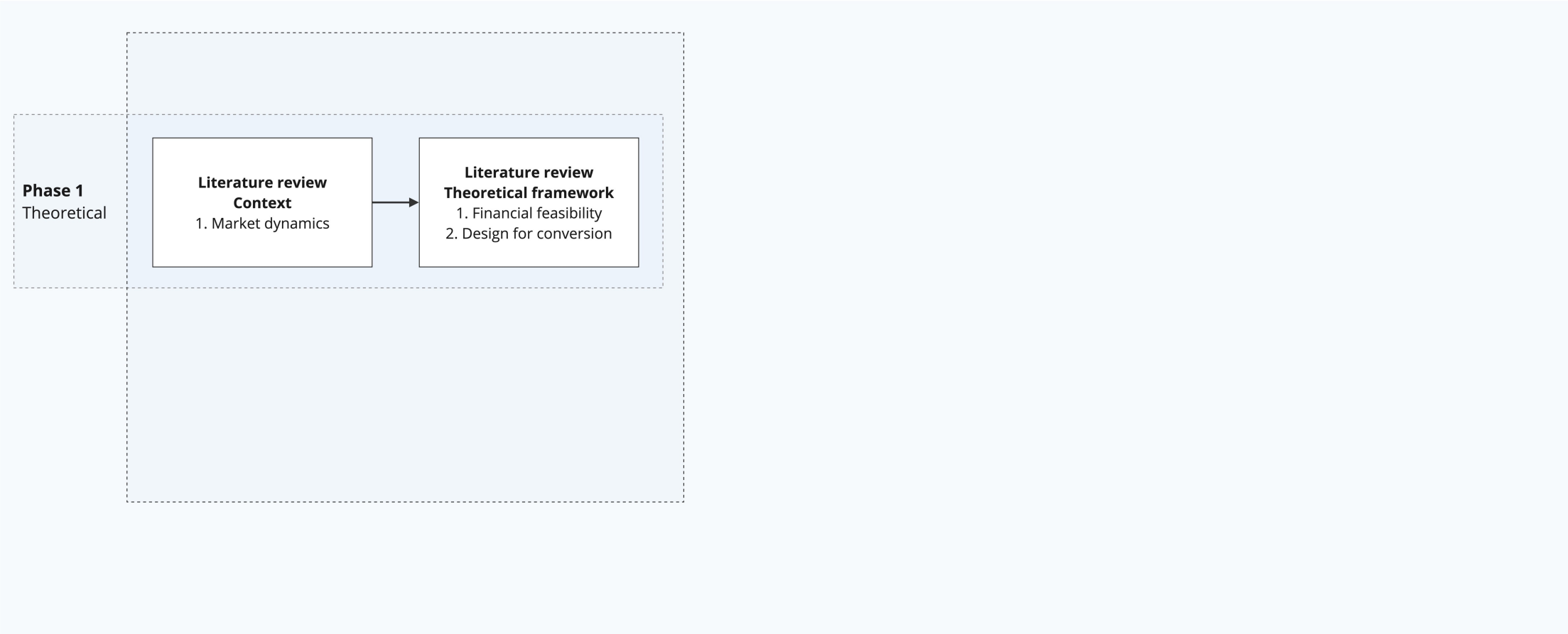

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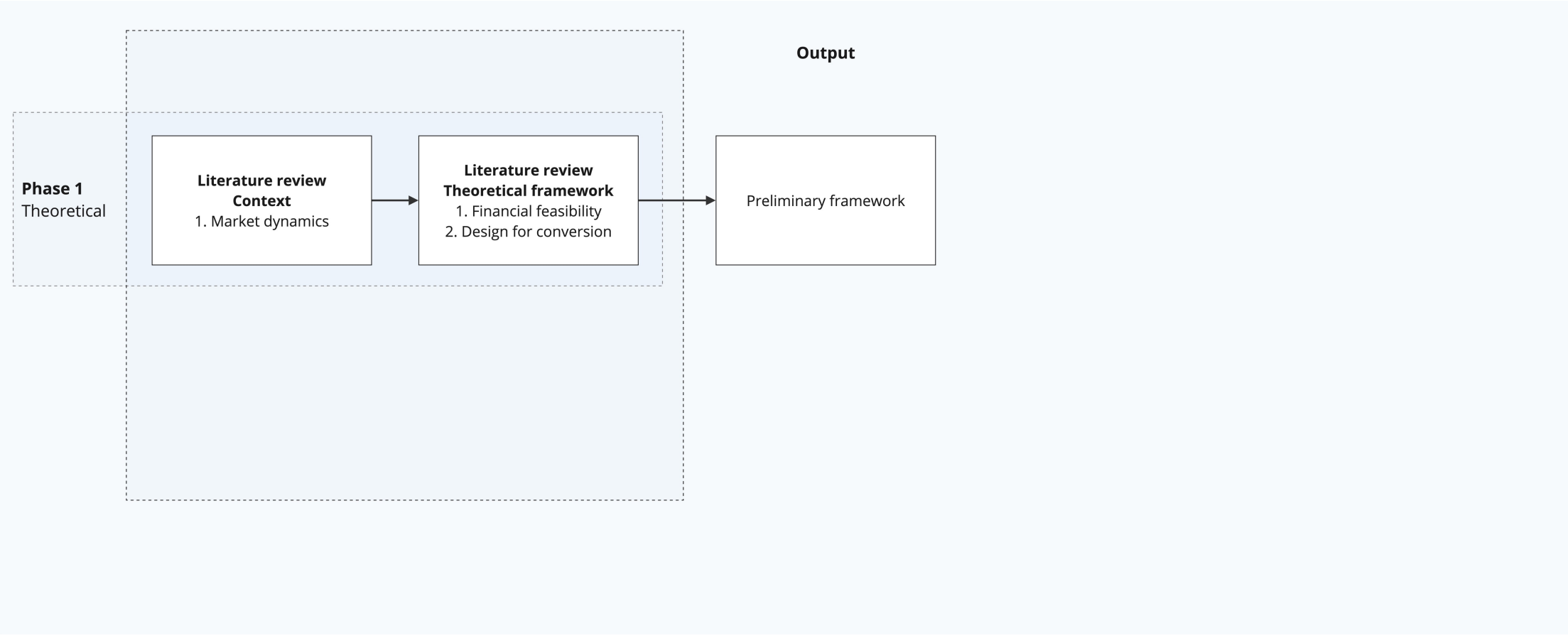

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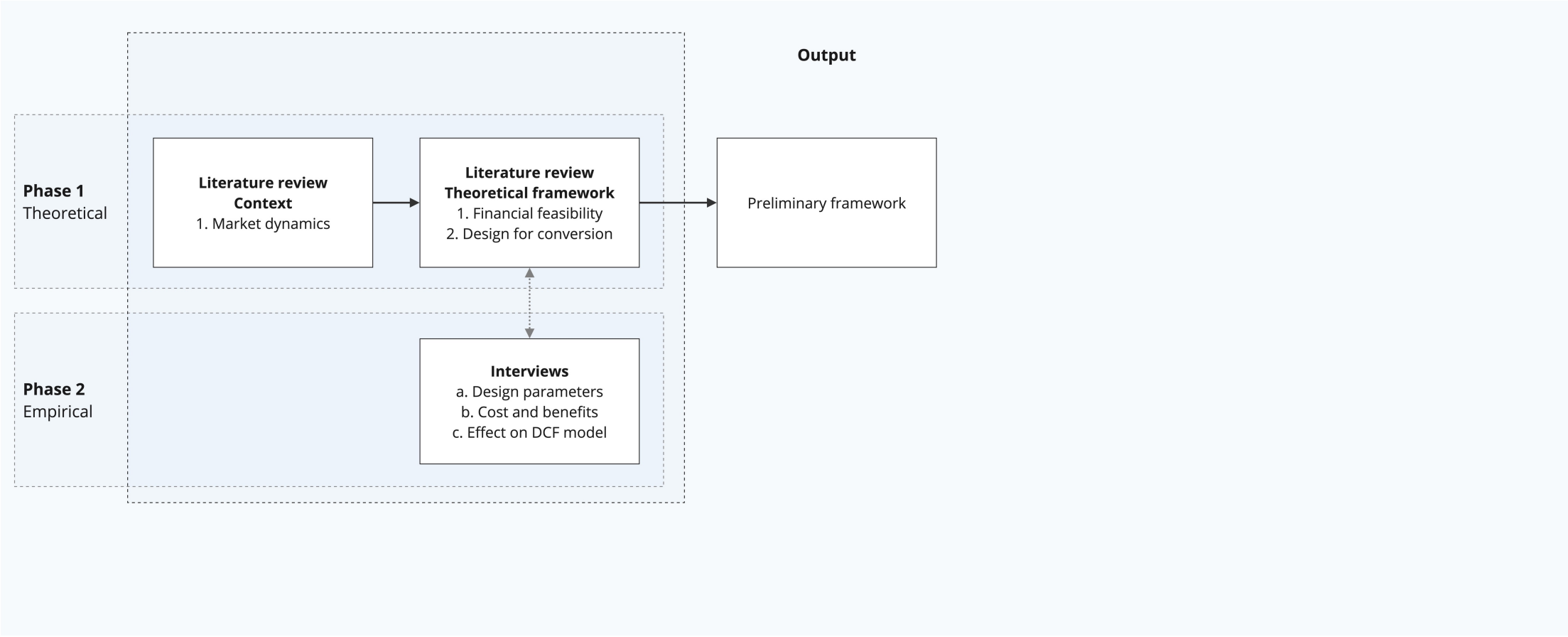

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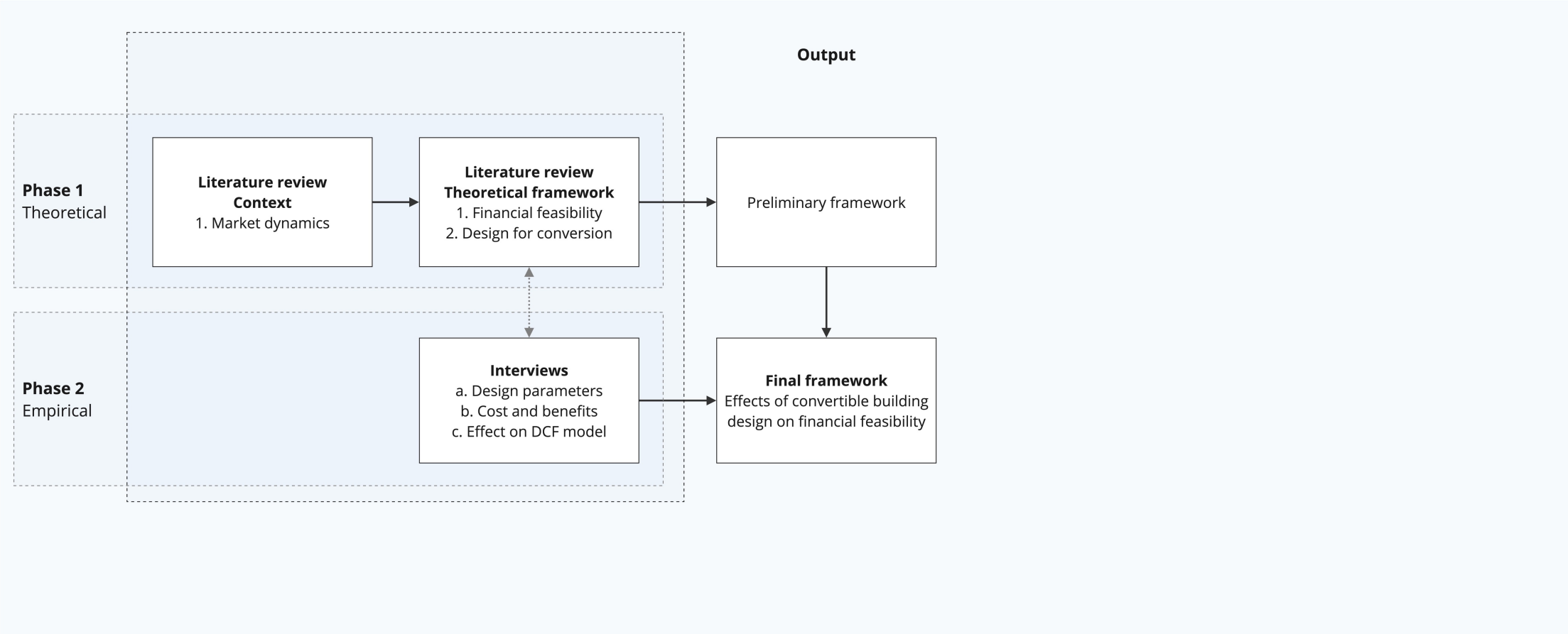

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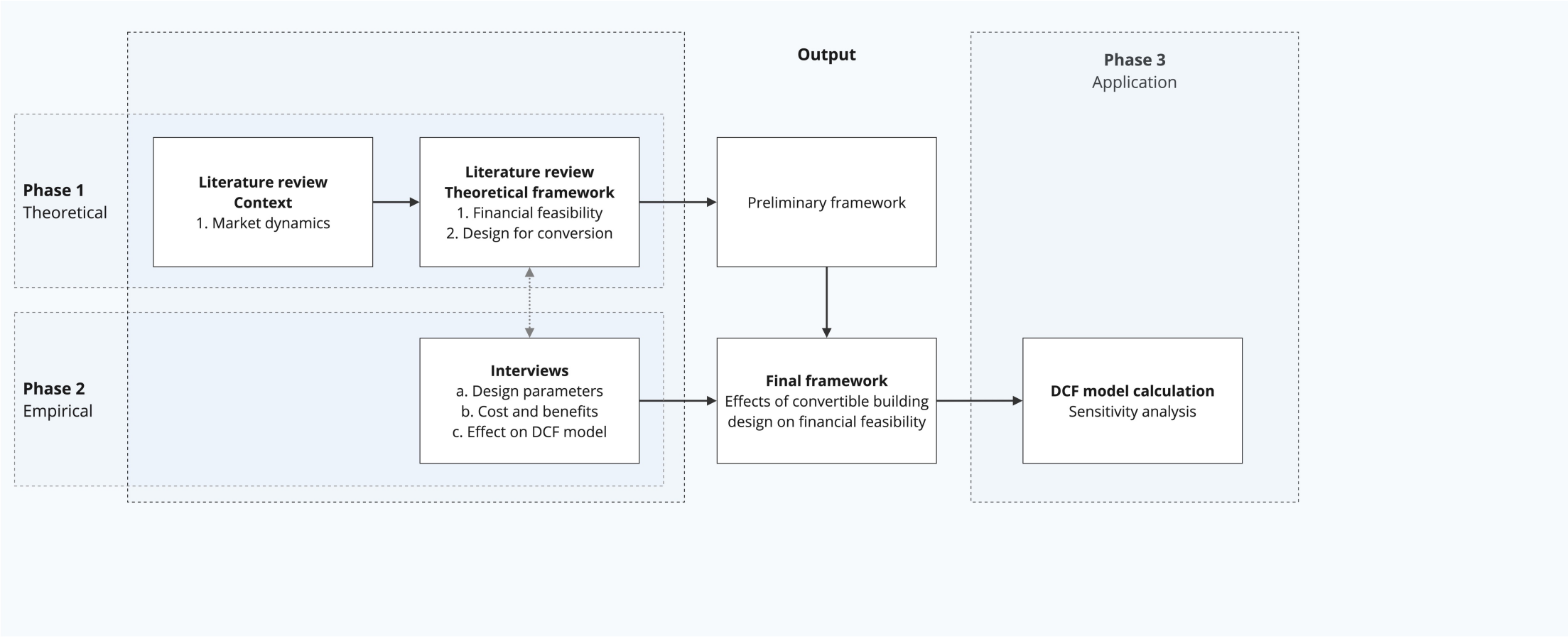

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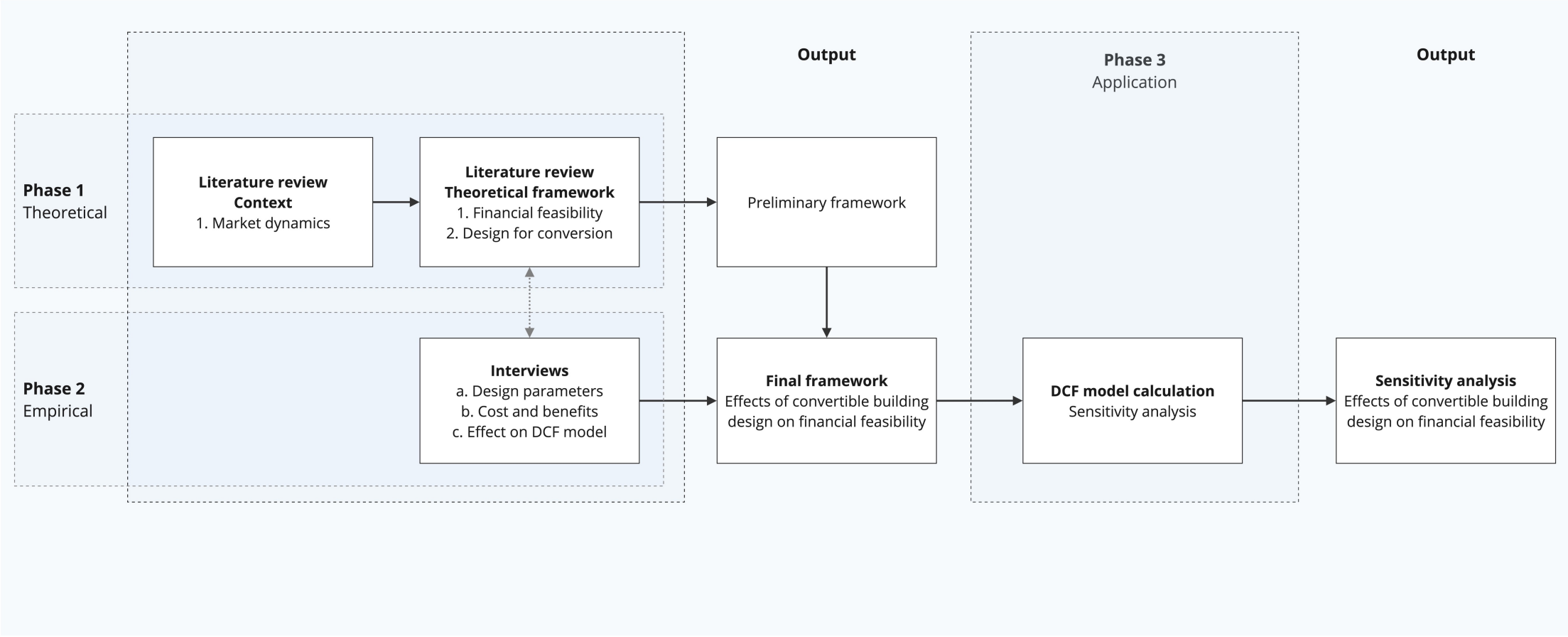

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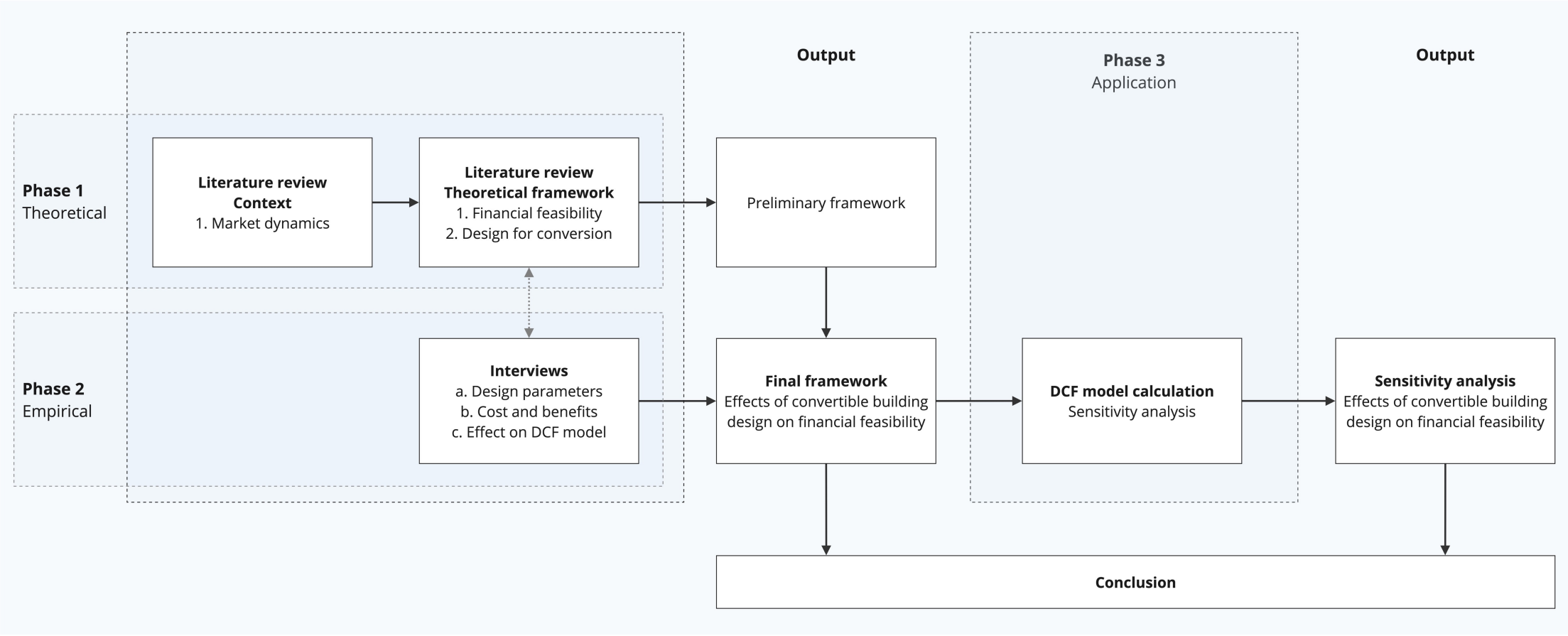
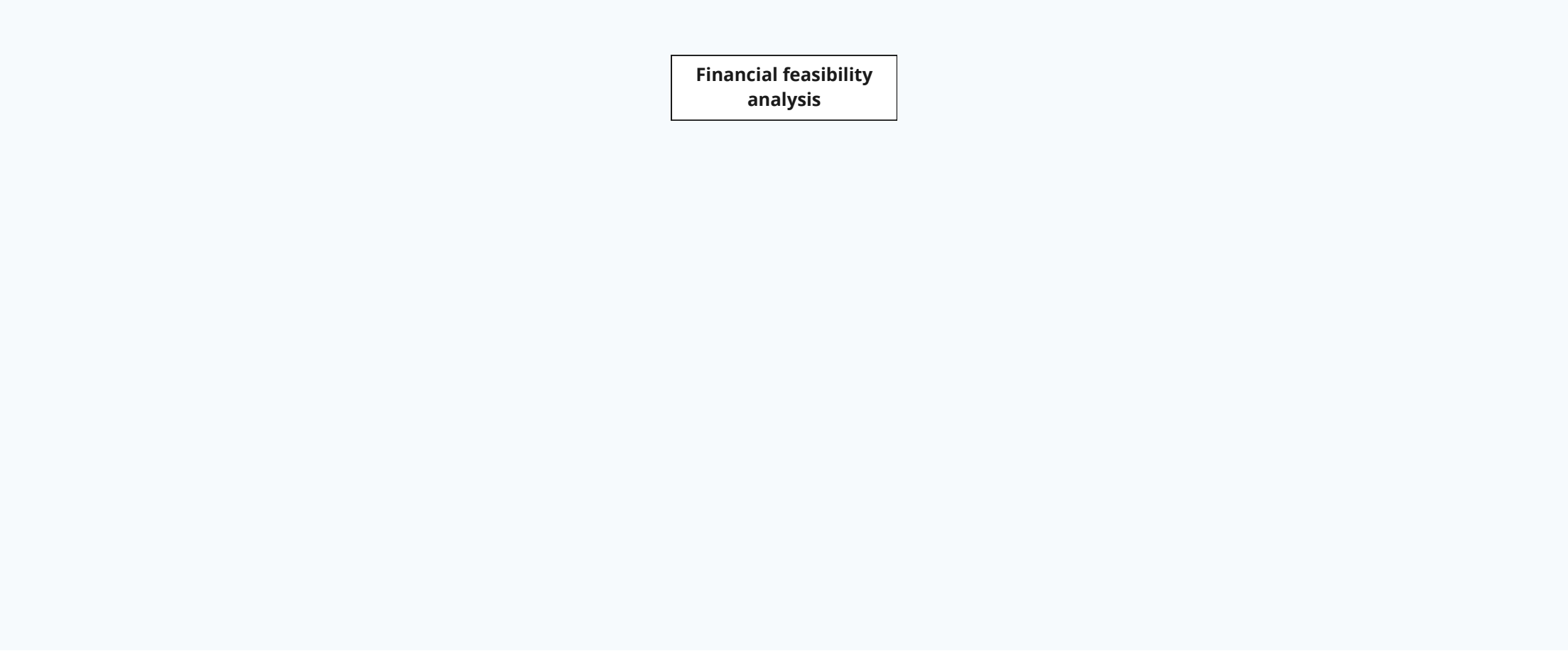


Theoretical framework

Financial feasibility

Financial feasibility



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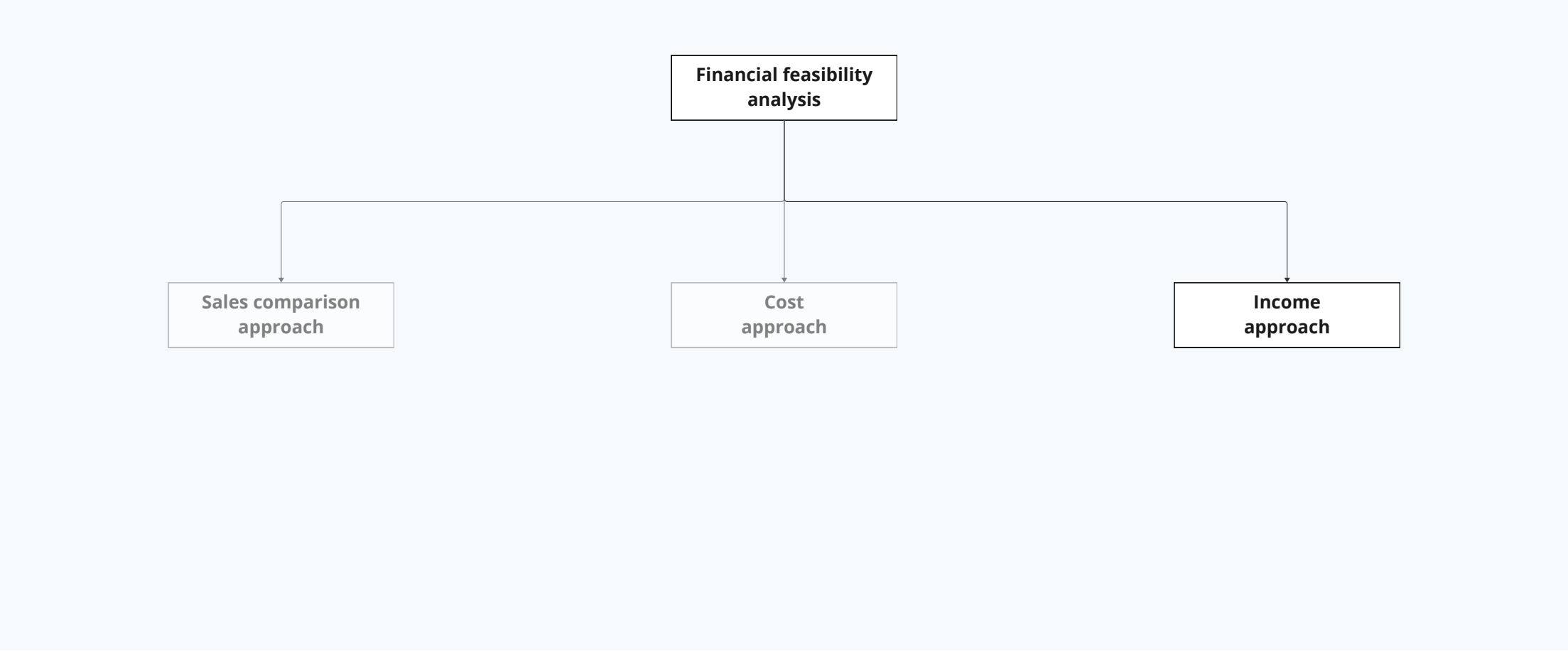

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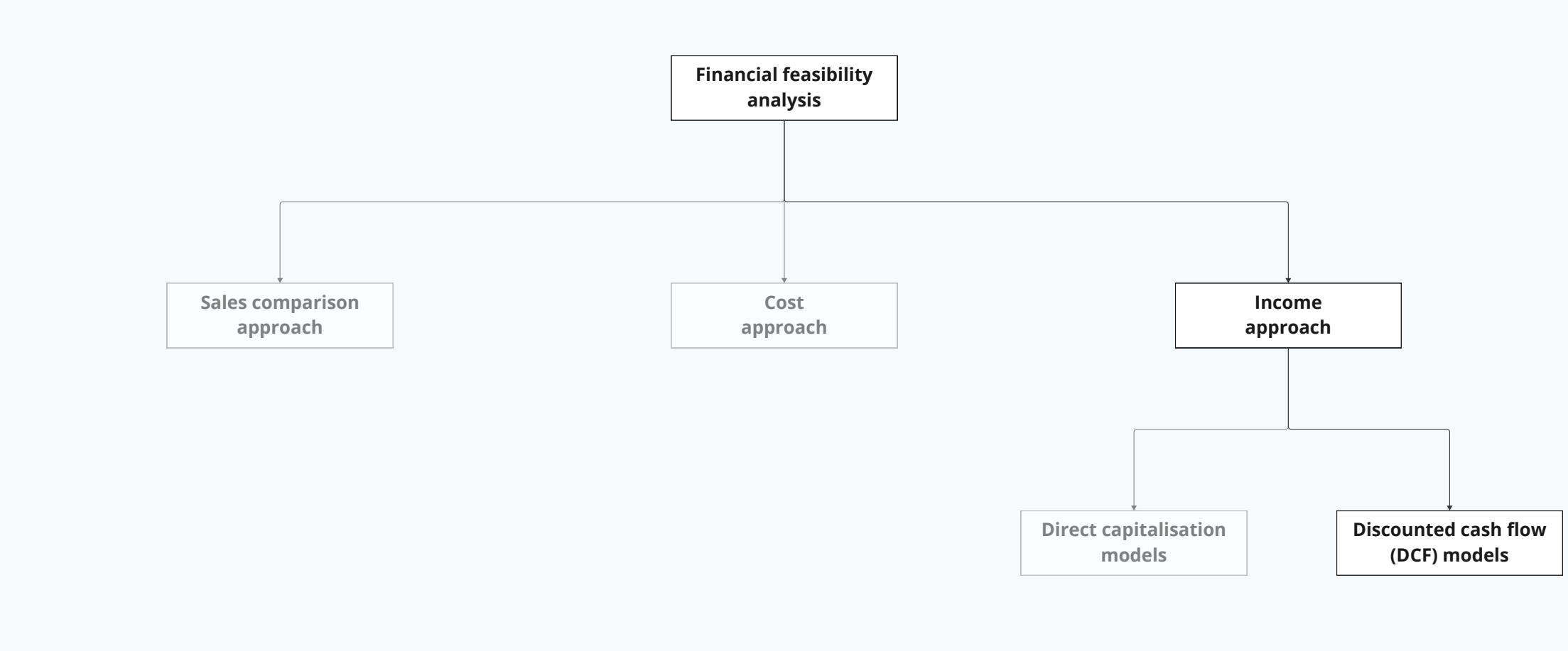


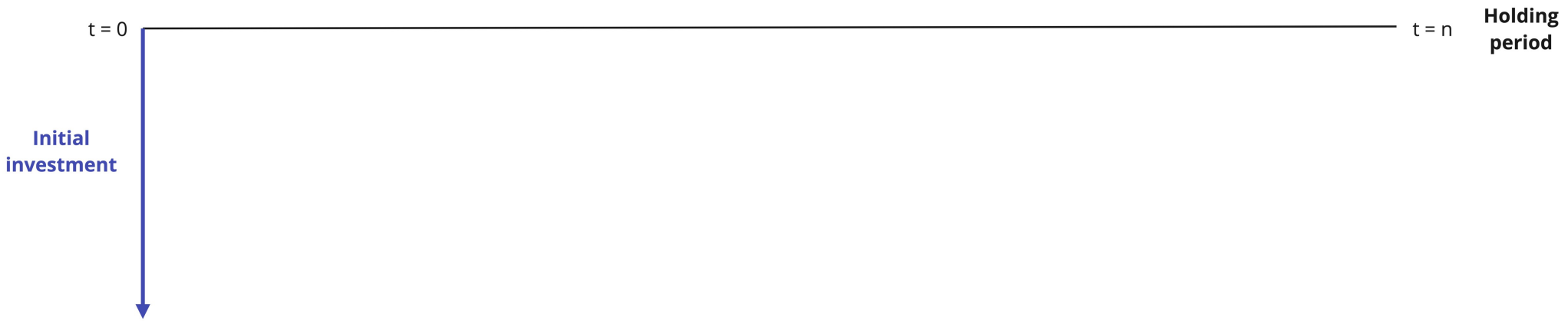
DCF model

DCF model

- Discounted cash flow model
- Assesses the property’s income and expenses over entire holding period as future cash flows
- Future cash flows are discounted back to present value

DCF model determinants

DCF model determinants



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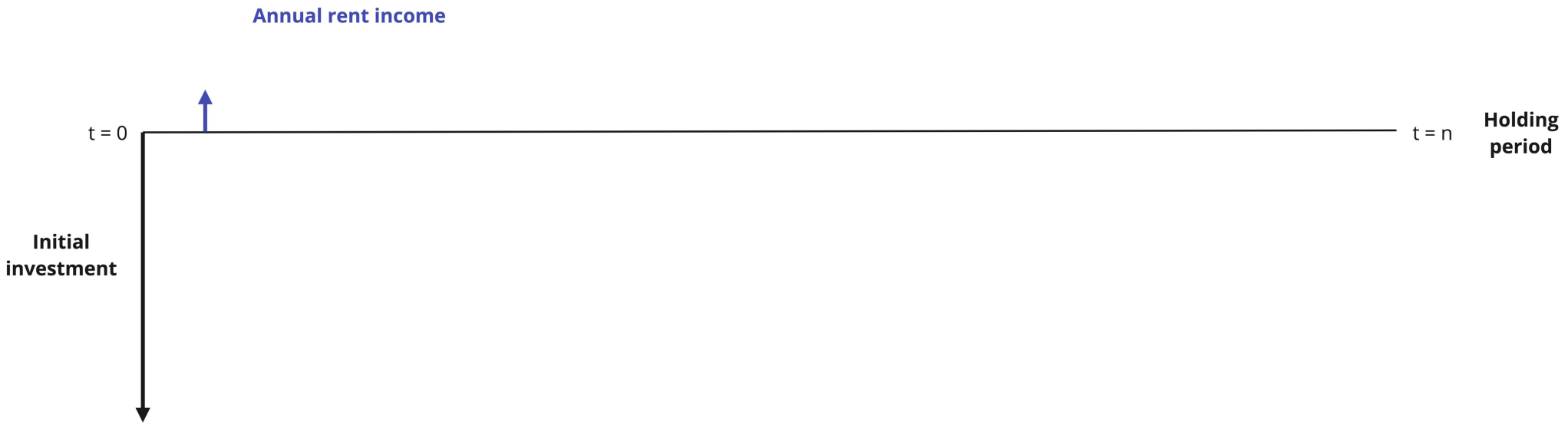

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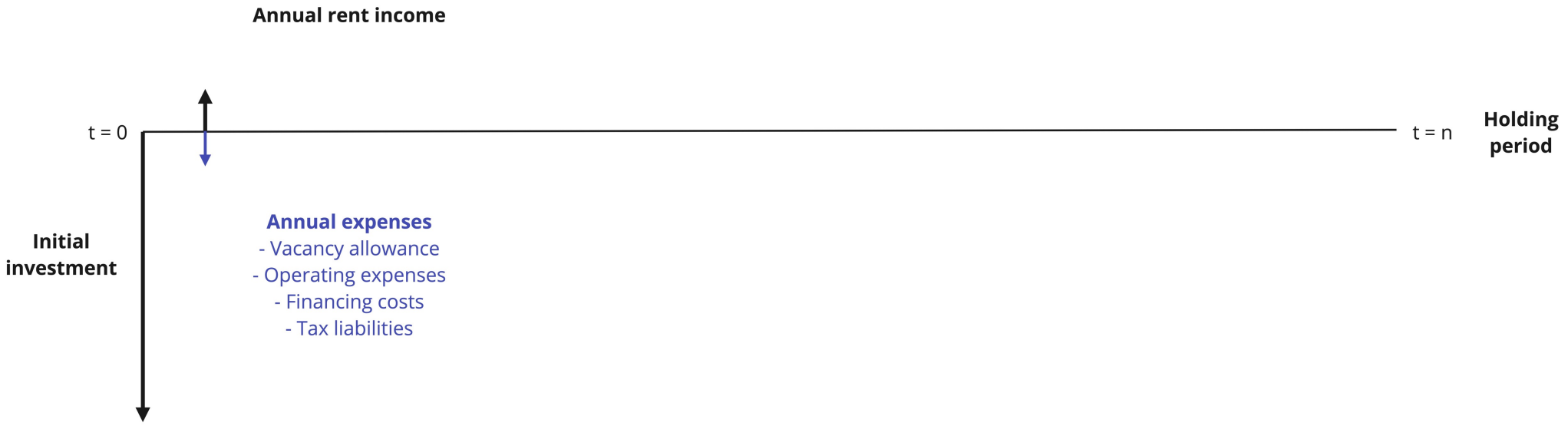

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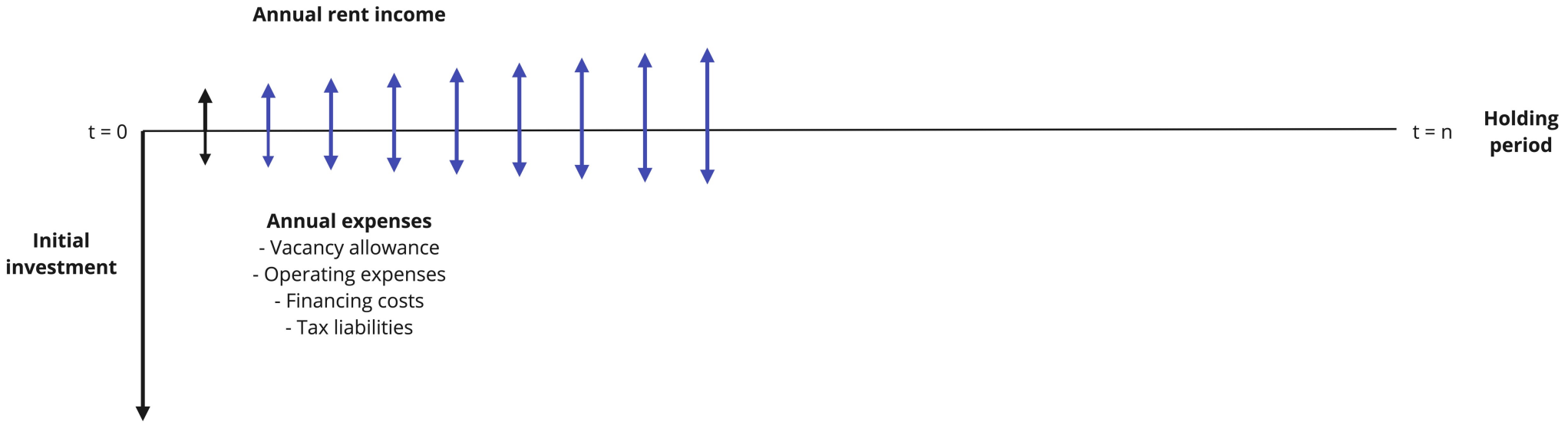

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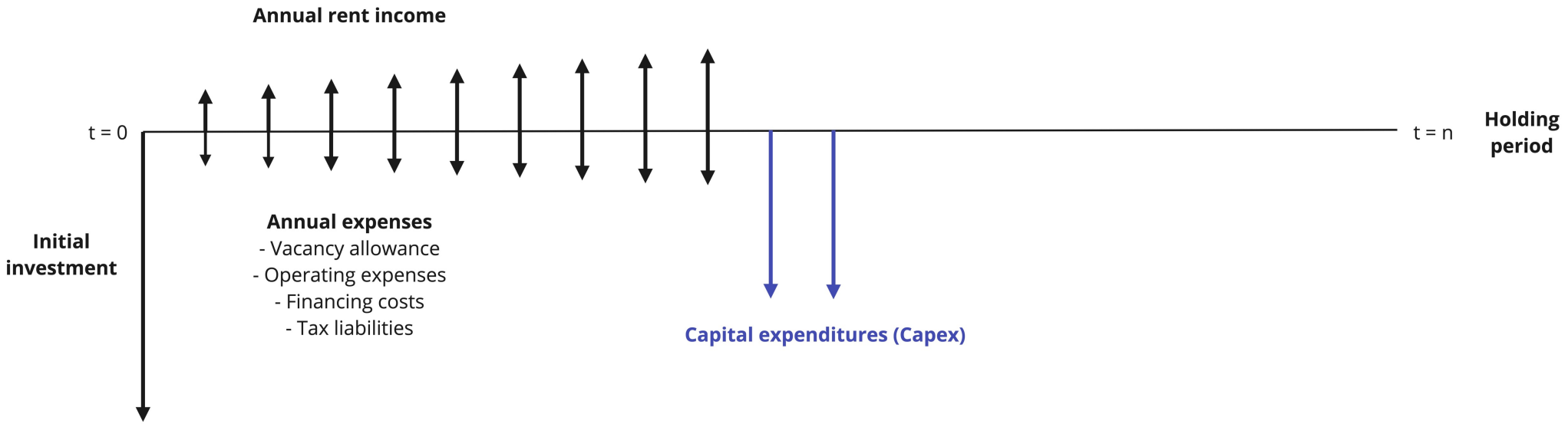

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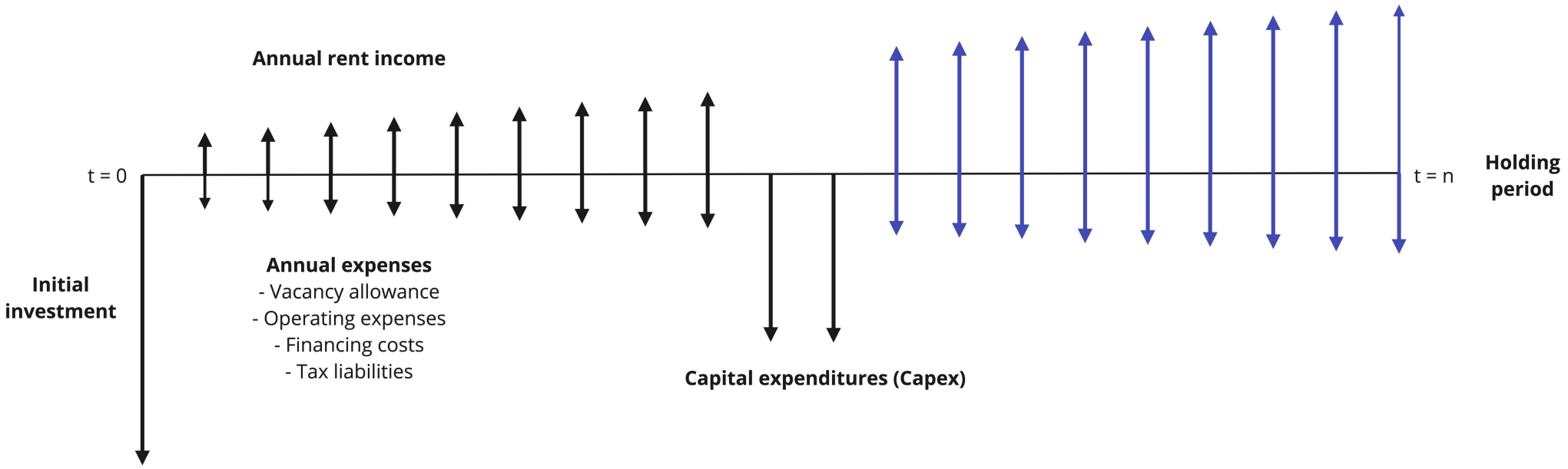

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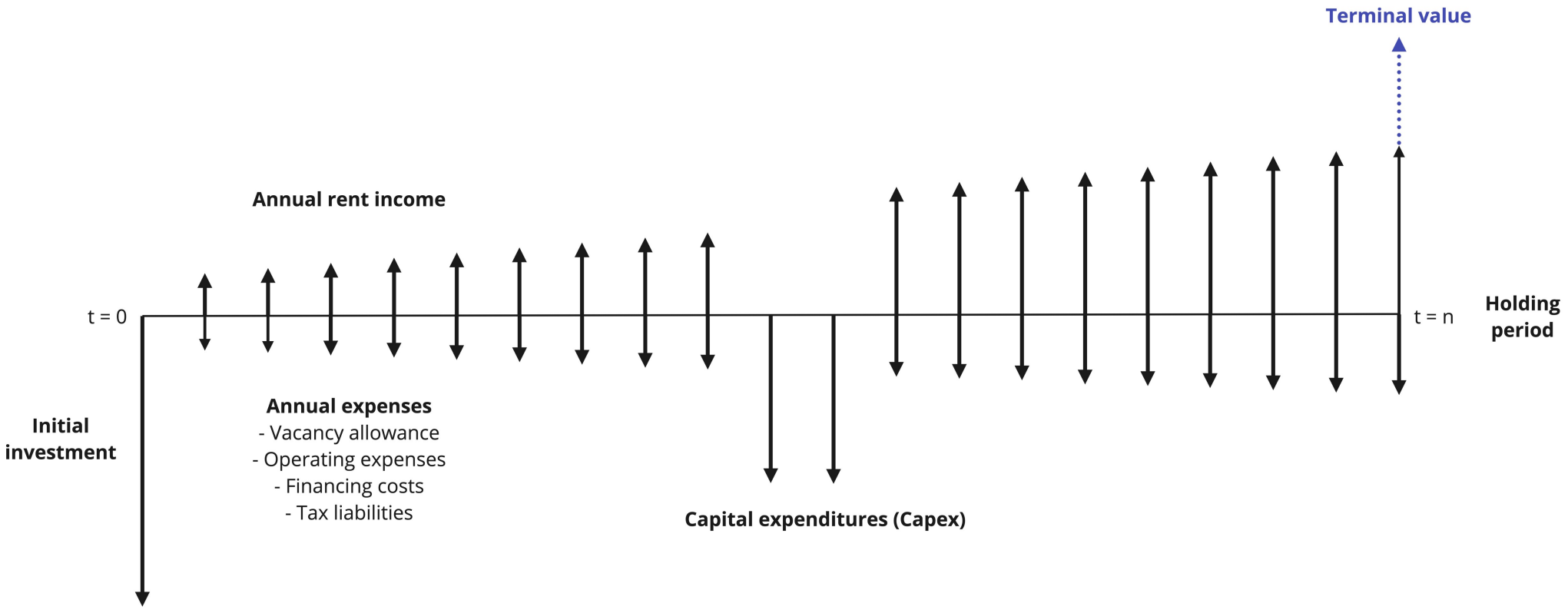

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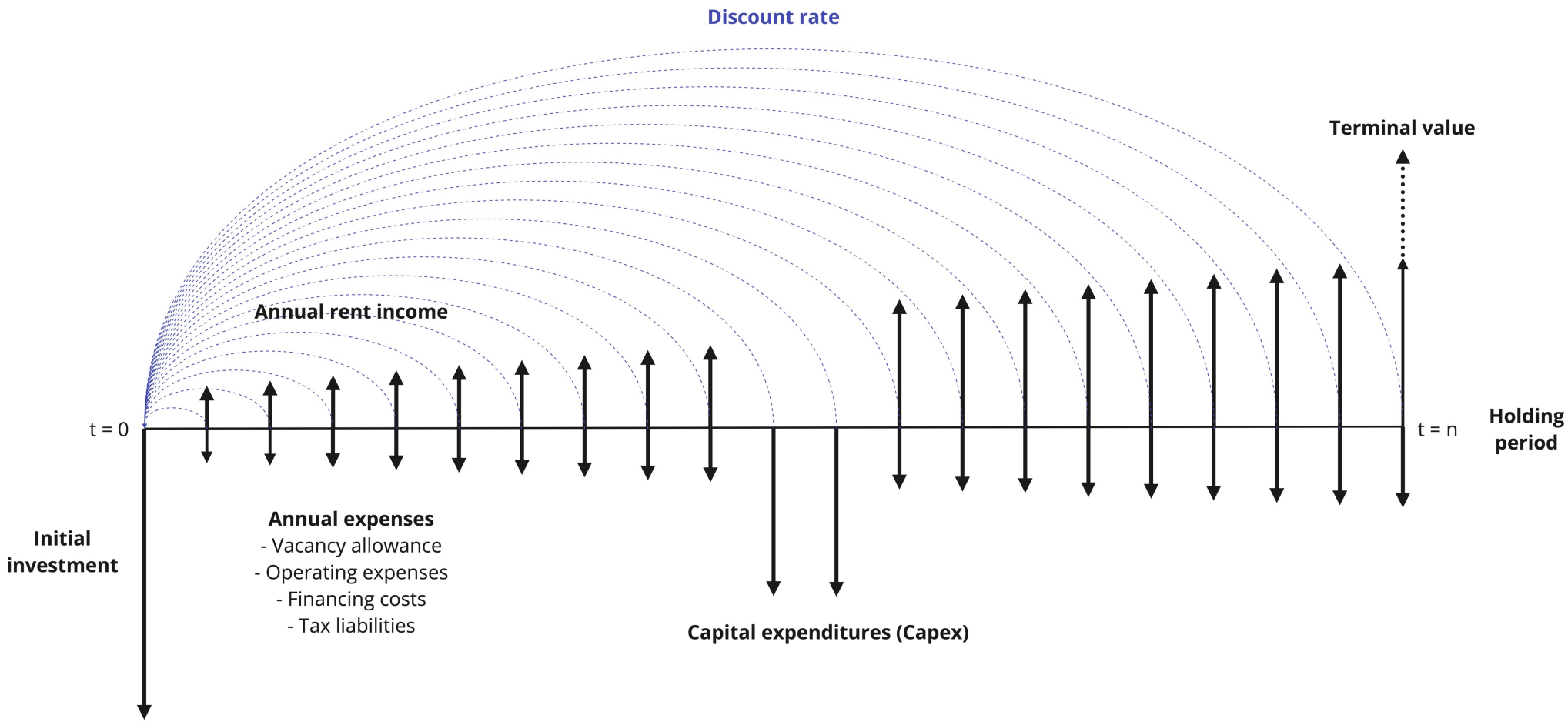

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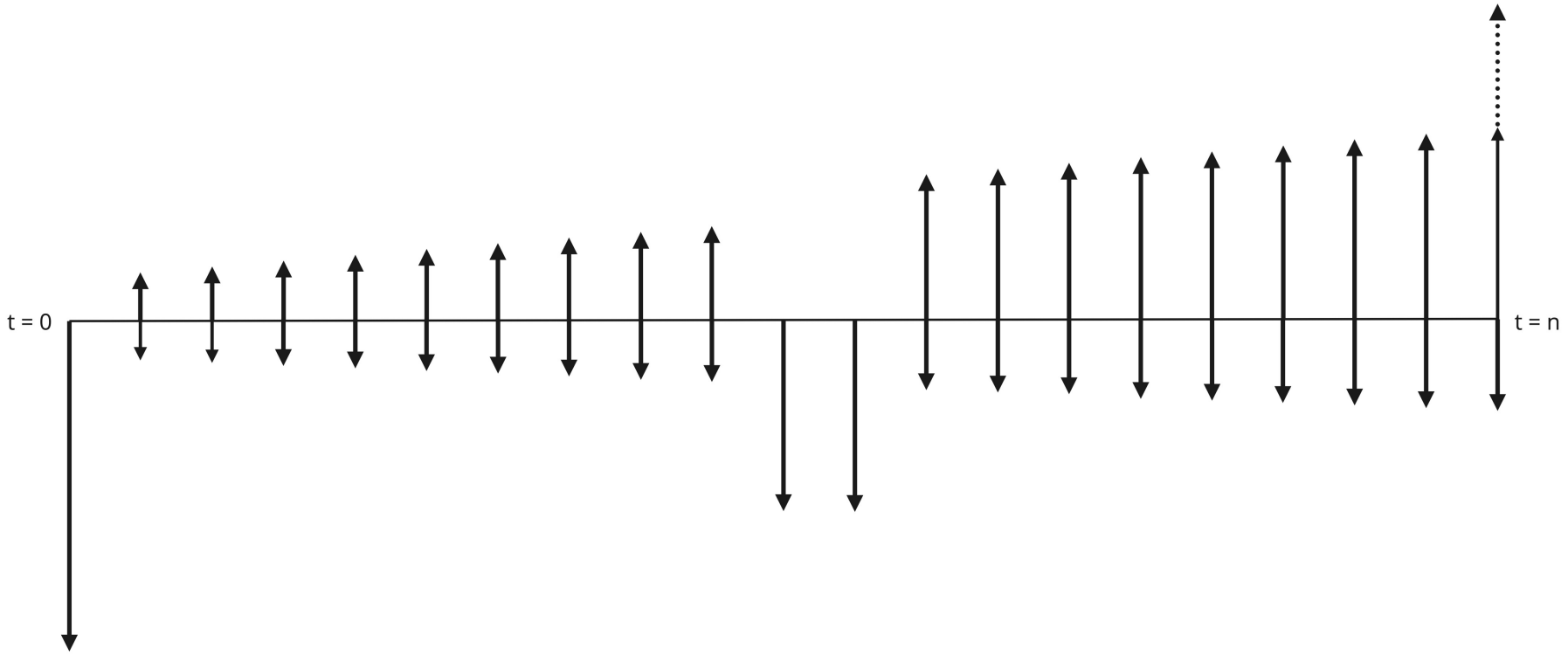


DCF model

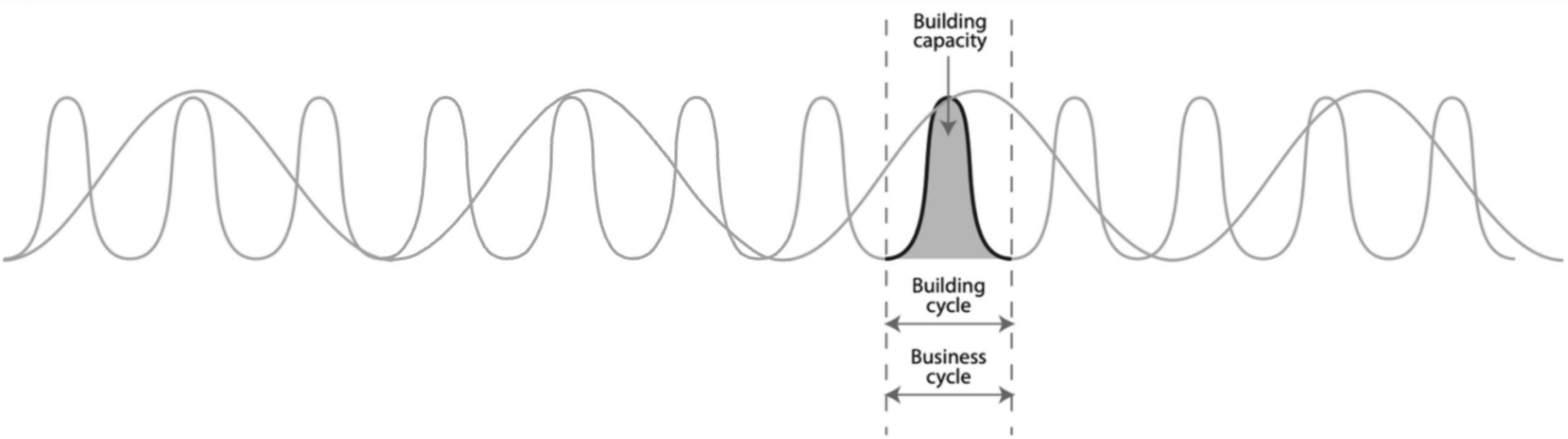
- Assessment criteria

DCF model

- Assessment criteria
  - Net present value (NPV)
  - Internal rate of return (IRR)

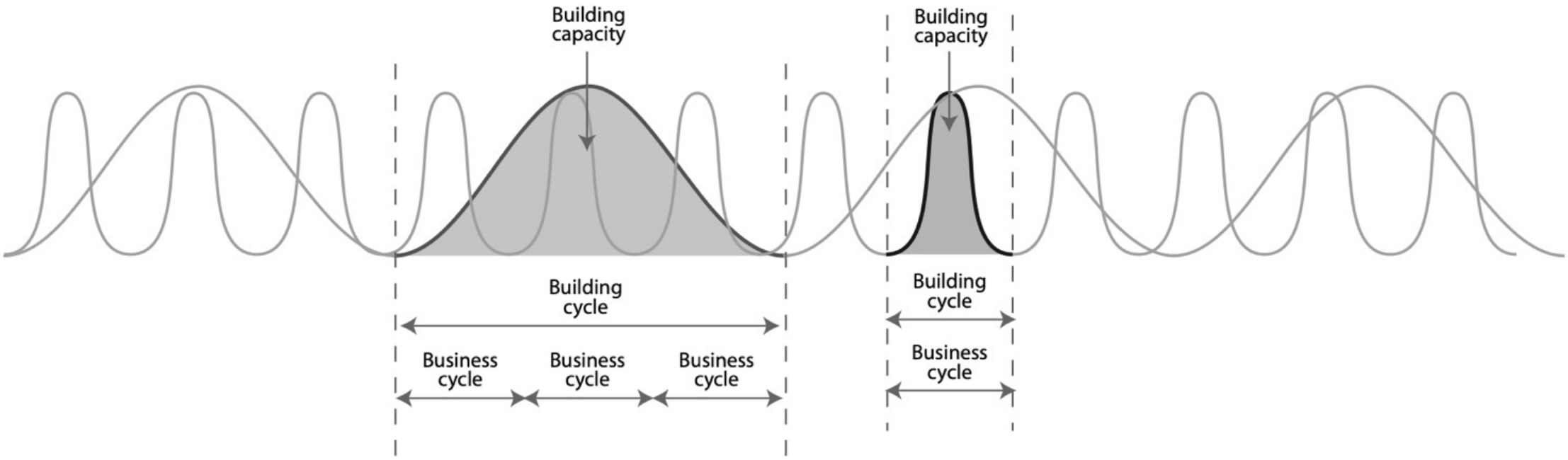
Design for conversion

Design for conversion



Extended lifecycle of the building through conversion (adapted from Schmidt III et al., 2009)

Design for conversion



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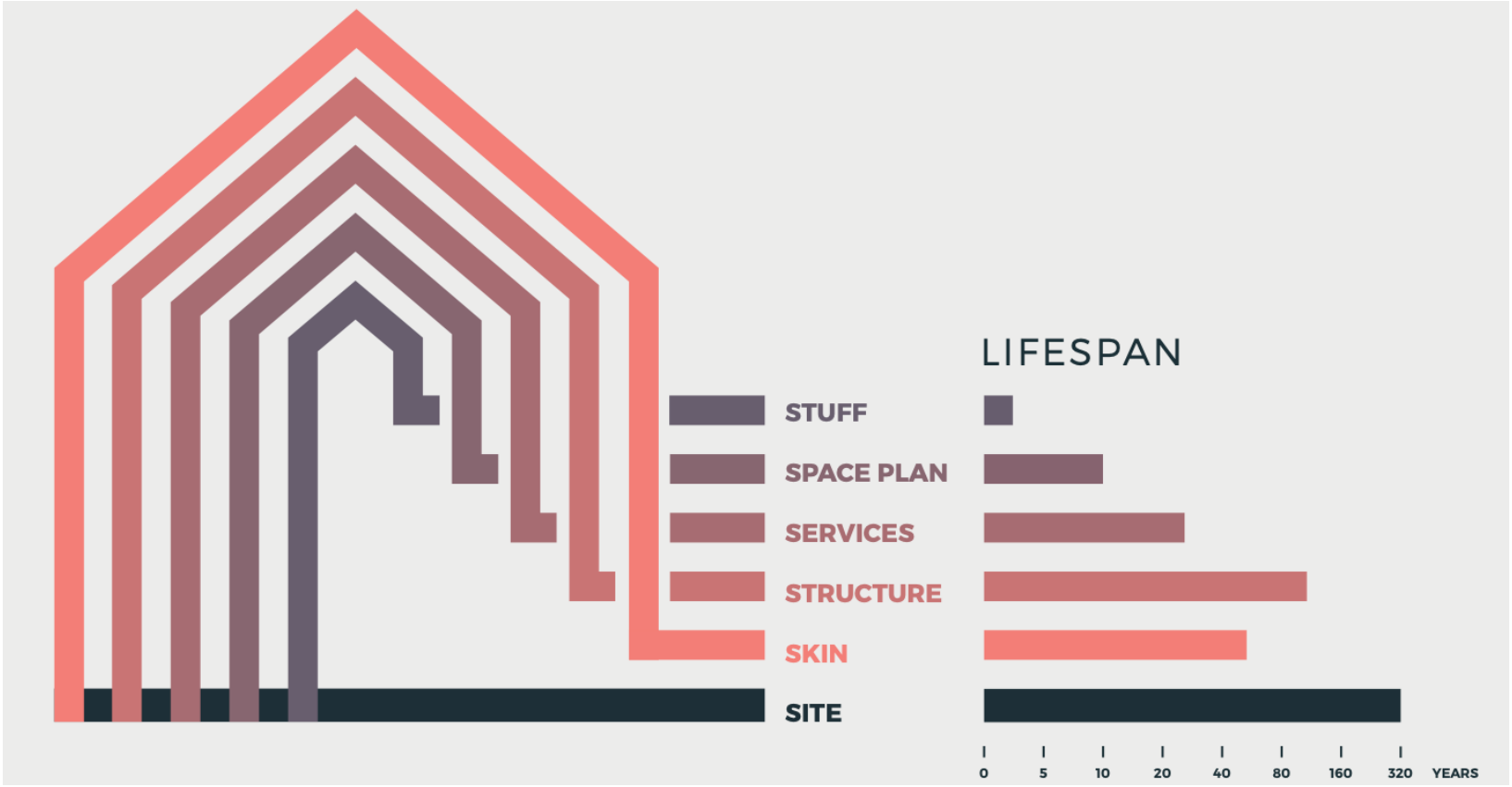


Shearing layers of change (adapted from Brand, 1994)

Findings

Boundary conditions

Boundary conditions

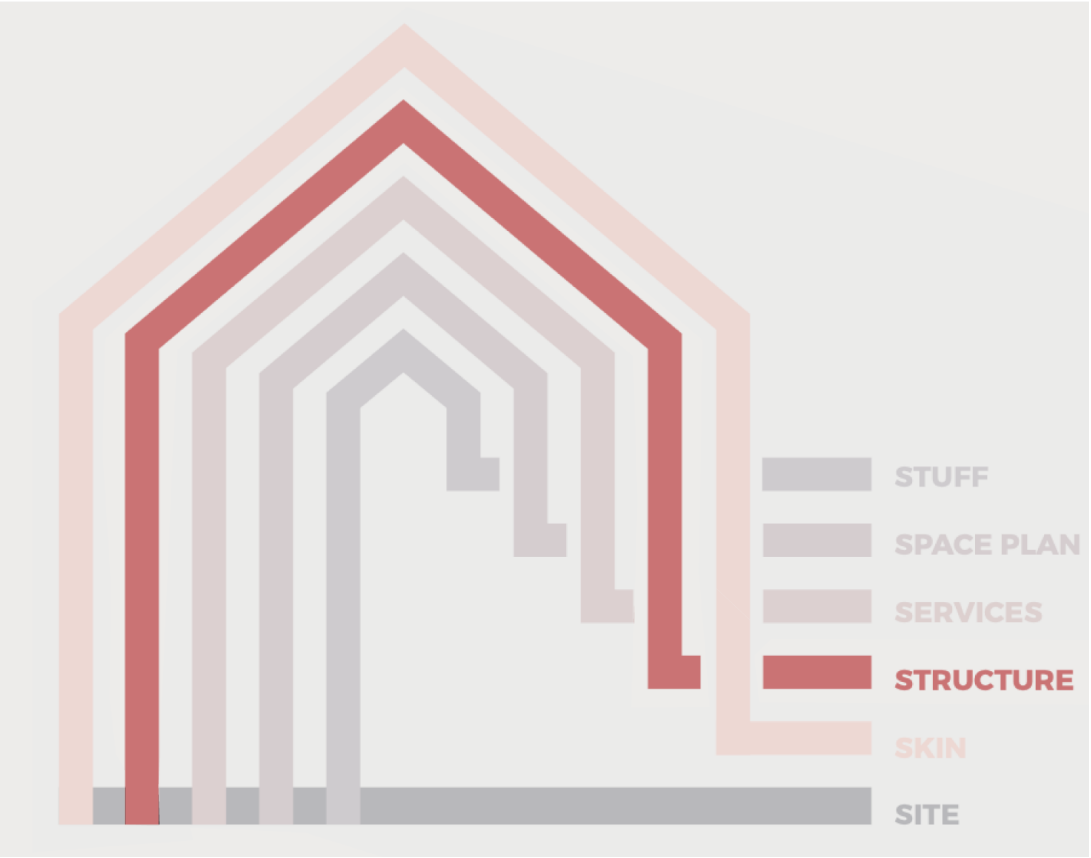
- **Zoning**
- Flexible zoning that allows for both functions

Boundary conditions

- **Zoning**
- Flexible zoning that allows for both functions
- **Location**
- Importance of urban amenities and accesibility

Design parameters

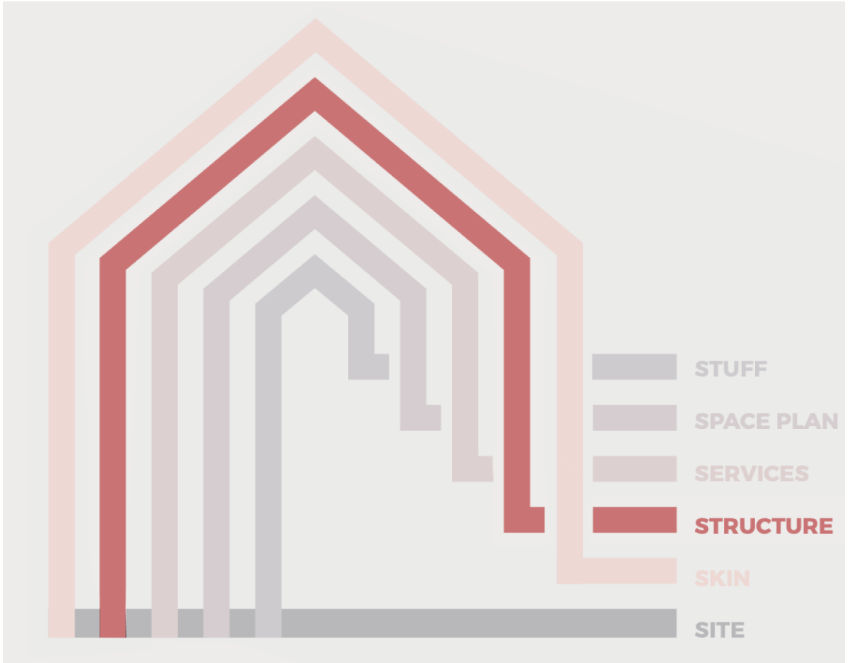
Design parameters



Shearing layers of change (adapted from Brand, 1994)

Design parameters - discussion

	Design parameter	Literature (out of 12)	Interviews (out of 16)
Structure	Expandability	5	2
	Fire resistance structure	4	3
	Fire safety design	4	2
	Floor space size	5	3
	Floor-to-floor height	**9**	**8**
	Insulation	5	4
	Material durability	3	1
	Plan depth	**9**	**7**
	Position cores	**8**	5
	Position entrances	**7**	4
	Possibility of attaching interior walls to structure	3	3
	Separation of structure and infill	6	4
	Structural design	6	**7**
	Structural grid	**8**	**6**
	Surplus load bearing capacity	**7**	**8**
	Balconies and outdoor space	0	2



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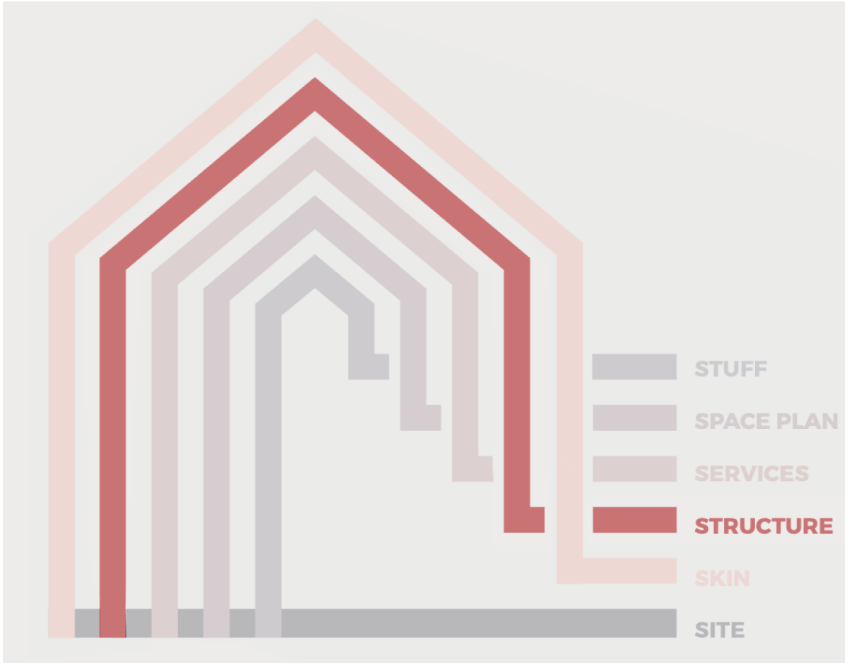

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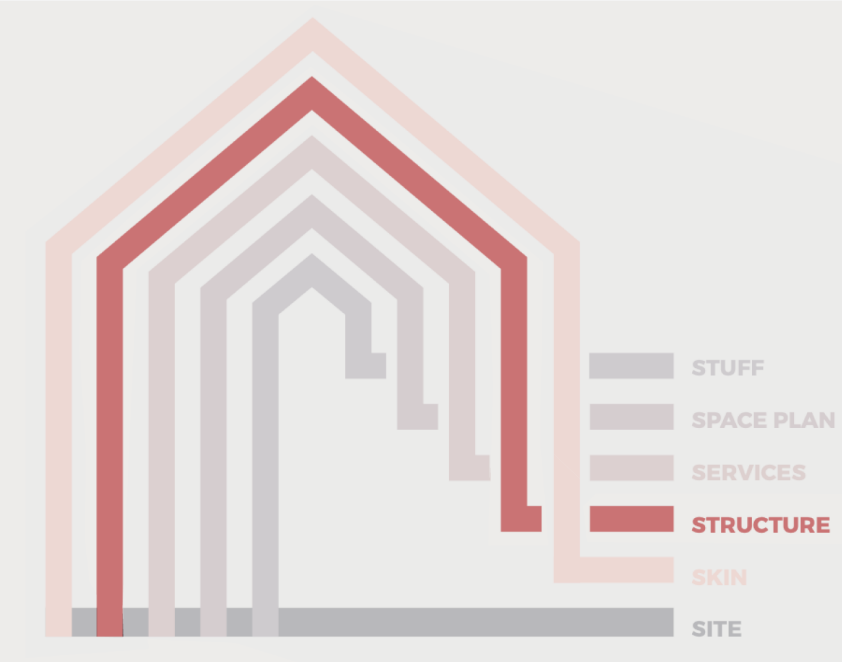

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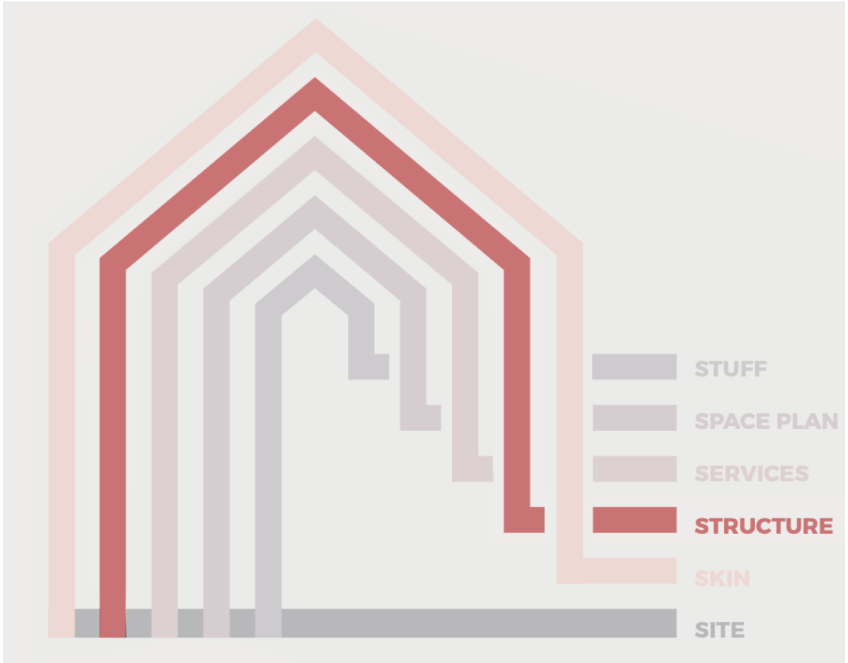

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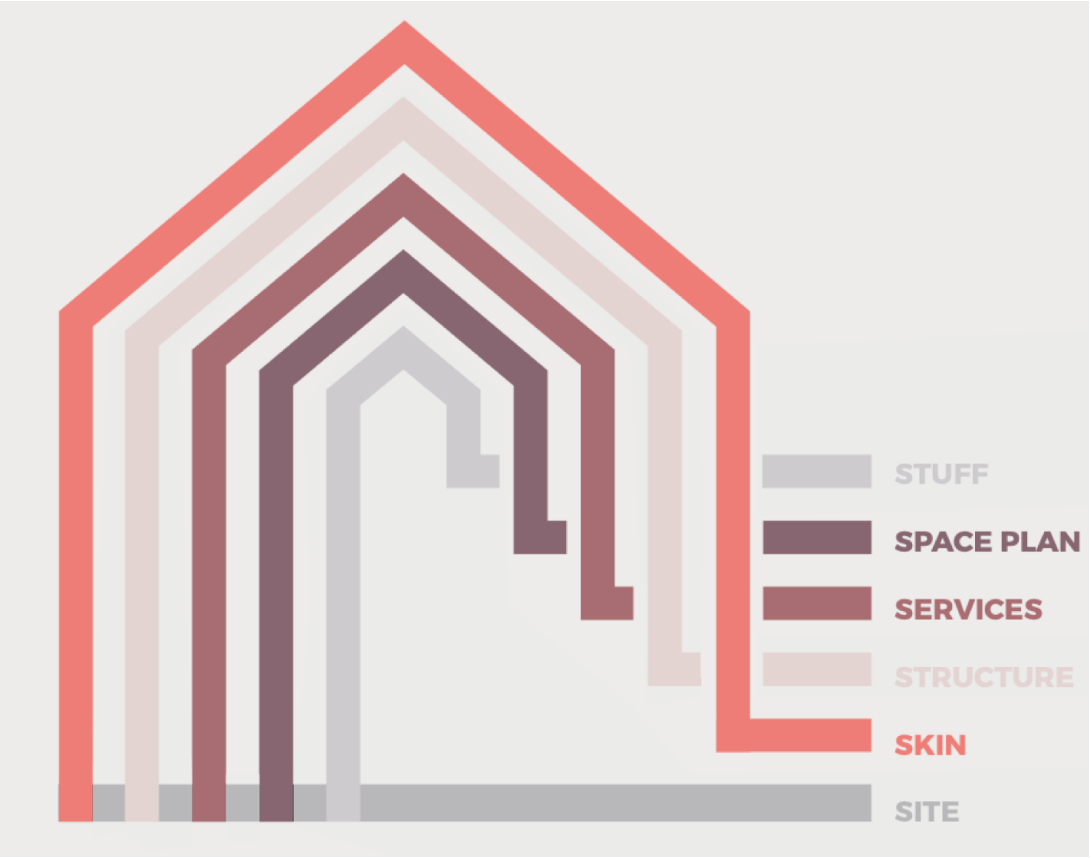

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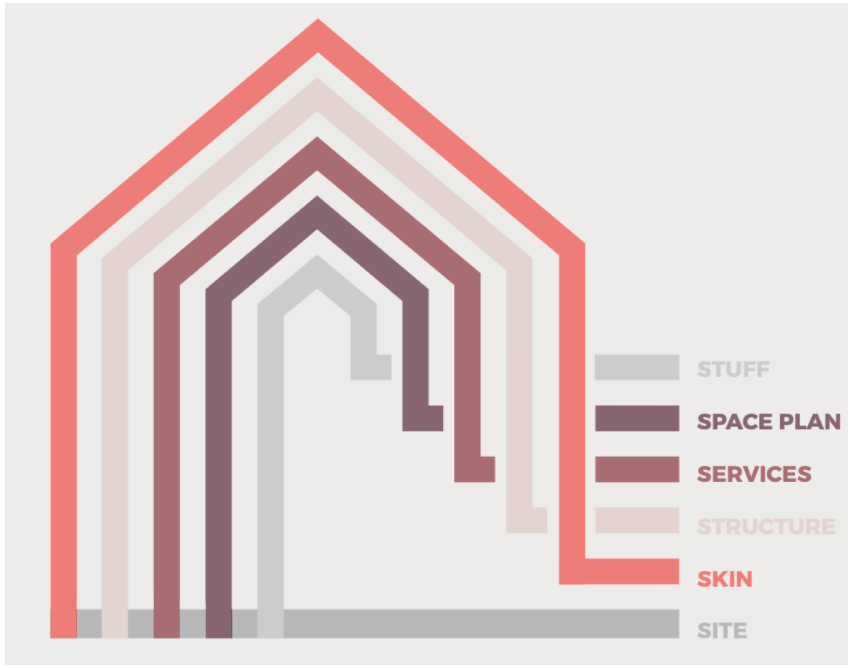
	Natural ventilation	2	2
	Possibility of attaching interior walls to façade	5	3
	Removable façade	**7**	4
Services	Accessibility of services	5	1
	Distribution of services	5	**5**
	Raised floors	**6**	4
	Shaft location	**6**	4
	Surplus of services and shaft capacity	**7**	**6**
	Suspended ceilings	4	4
Space plan	Adaptable interior walls	2	3
	Dismountable connection detailing interior walls	3	2
	Standardised components	2	1



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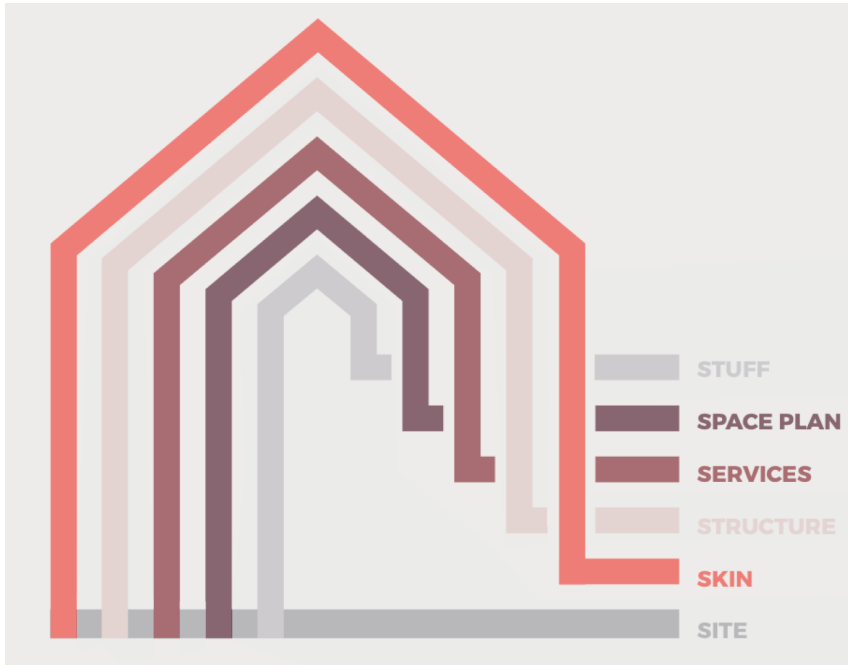

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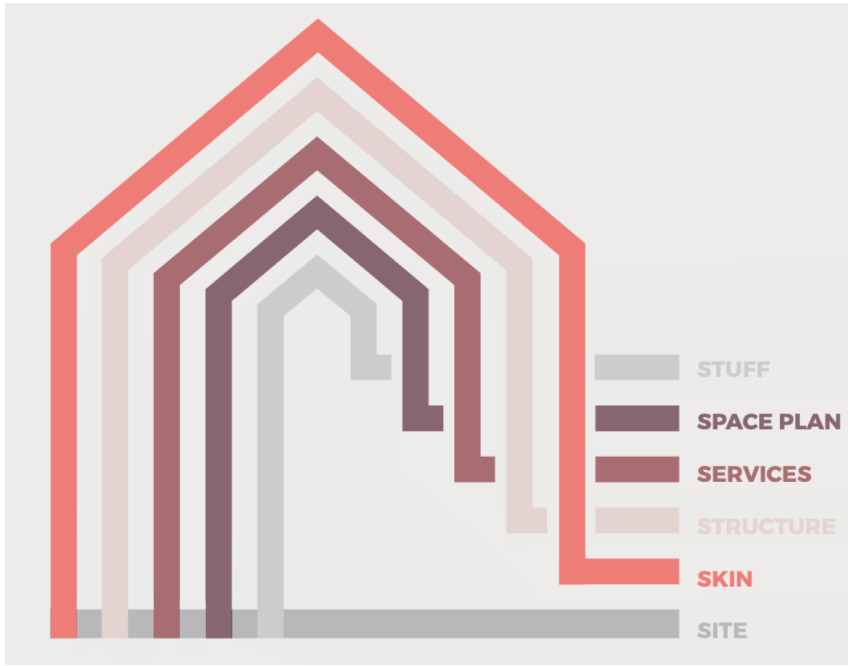

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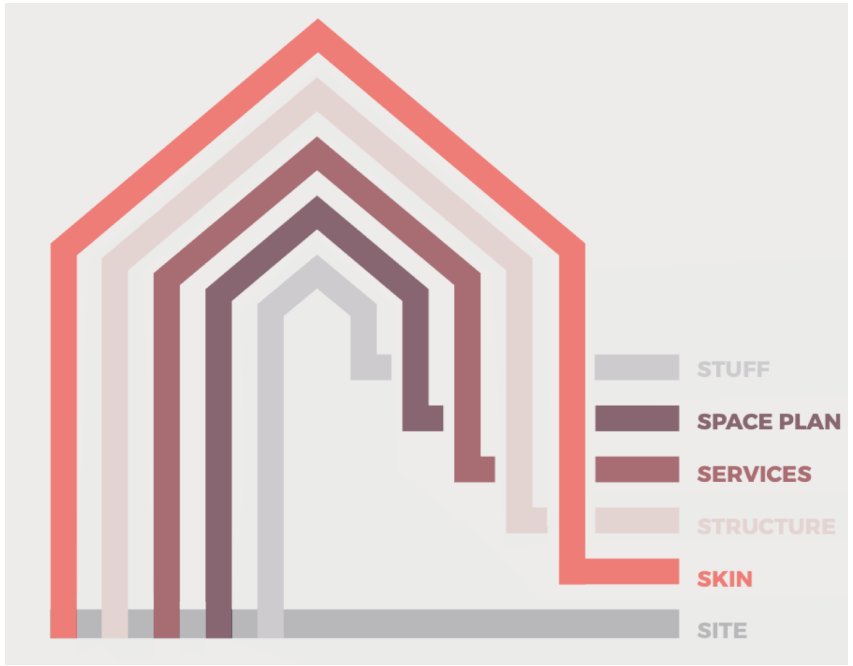

Shearing layers of change (adapted from Brand, 1994)

Effects on DCF model

Effects on DCF model

Lit.	Int.	Costs and benefits convertibility	Effect on DCF determinant		Effect on NPV
x	x	• Extended building lifespan	Holding period	↑	0
x	x	• Increased design and planning costs	Initial investment	↑	–
	x	• Increased other professional fees (i.e. zoning)			
x	x	• Increased construction costs			
x	x	• Reduced long-term vacancy risk	Vacancy rate	↓	+
	x	• Sustainability premium on rent	Potential rent income	↑	+
	x	• Loss of usable floor space	Potential rent income	↓	–
	x	• Reduced space efficiency			
x		• Reduced maintenance costs	Operating expenses	↓	+
	x	• Reduced long-term investment risk	Financing costs	↓	+
	x	• Potential tax concessions	Tax liability	↓	+
x		• Reduced maintenance costs	Capital expenditures	↓	+
x	x	• Shorter conversion time	Capital expenditures	↓	(+)
x	x	• Lower conversion construction costs			
x	x	• Reduced long-term investment risk	Terminal value	↑	+
	x	• Sustainability premium on sale			
	x	• Reduced long-term investment risk	Discount rate	↓	+

Final framework

Effects on DCF model

Lit.	Int.	Costs and benefits convertibility	Effect on DCF determinant		Effect on NPV
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	x	• Increased other professional fees (i.e. zoning)	Initial investment	↑	–
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x	x	• Reduced long-term vacancy risk	Vacancy rate	↓	+
	x	• Sustainability premium on rent	Potential rent income	↑	+
	x	• Loss of usable floor space	Potential rent income	↓	–
	x	• Reduced space efficiency			
x		• Reduced maintenance costs	Operating expenses	↓	+
	x	• Reduced long-term investment risk	Financing costs	↓	+
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x		• Reduced maintenance costs	Capital expenditures	↓	+
x	x	• Shorter conversion time	Capital expenditures	↓	(+)
x	x	• Lower conversion construction costs			
x	x	• Reduced long-term investment risk	Terminal value	↑	+
	x	• Sustainability premium on sale			
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Final framework

Effects on DCF model

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	x	• Sustainability premium on sale			
	x	• Reduced long-term investment risk	Discount rate	↓	+

Final framework

Effects on DCF model

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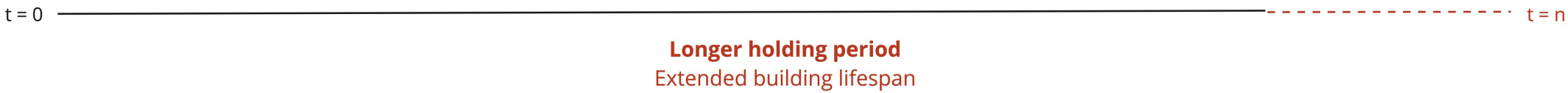
x	x	• Increased construction costs			
x	x	• Reduced long-term vacancy risk	Vacancy rate	↓	+
	x	• Sustainability premium on rent	Potential rent income	↑	+
	x	• Loss of usable floor space	Potential rent income	↓	–
	x	• Reduced space efficiency			
x		• Reduced maintenance costs	Operating expenses	↓	+
	x	• Reduced long-term investment risk	Financing costs	↓	+
	x	• Potential tax concessions	Tax liability	↓	+
x		• Reduced maintenance costs	Capital expenditures	↓	+
x	x	• Shorter conversion time	Capital expenditures	↓	(+)
x	x	• Lower conversion construction costs			
x	x	• Reduced long-term investment risk	Terminal value	↑	+
	x	• Sustainability premium on sale			
	x	• Reduced long-term investment risk	Discount rate	↓	+

Final framework

Effects on DCF model

Costs and benefits convertibility	Effect on DCF determinant		Effect on NPV
• Extended building lifespan	Holding period	↑	0

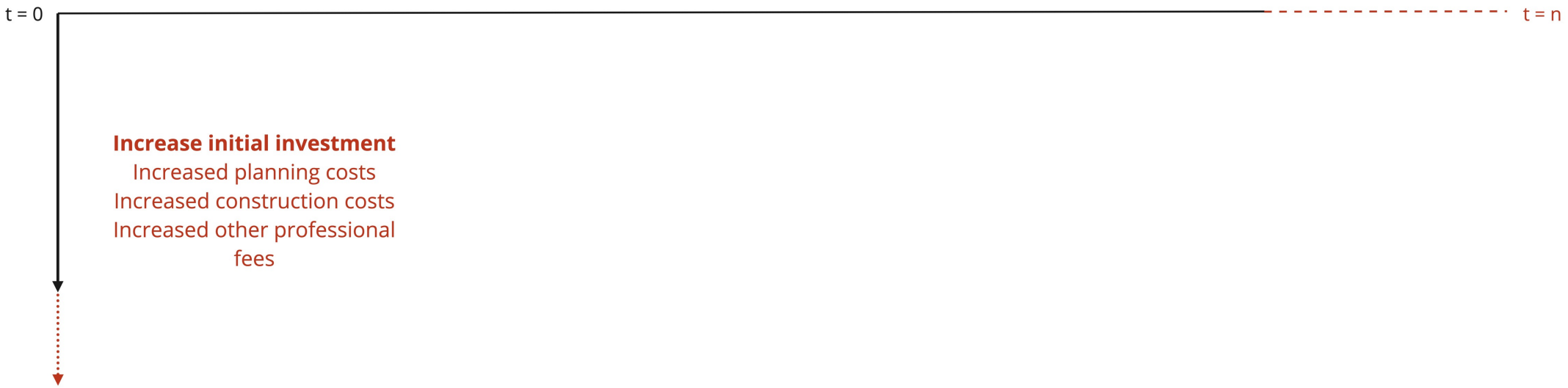
Effects on DCF model



Effects on DCF model

Costs and benefits convertibility	Effect on DCF determinant		Effect on NPV
• Extended building lifespan	Holding period	↑	0
• Increased design and planning costs	Initial investment	↑	–
• Increased other professional fees (i.e. zoning)			
• Increased construction costs			

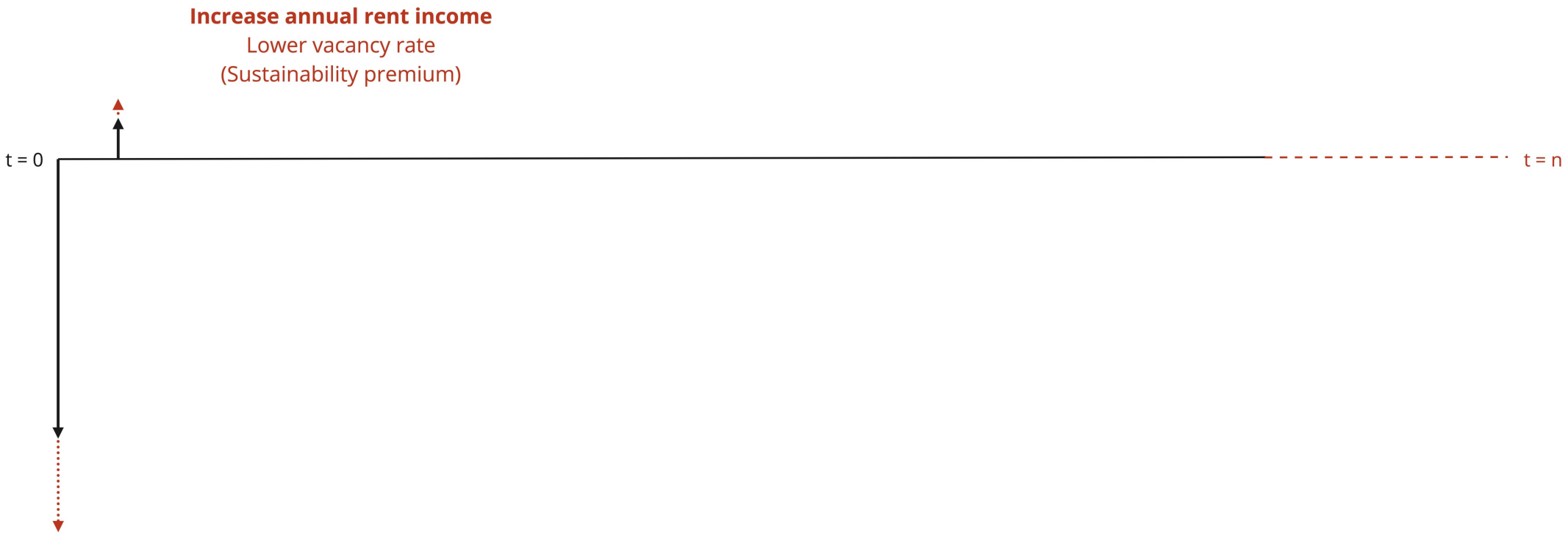
Effects on DCF model



Effects on DCF model

Costs and benefits convertibility	Effect on DCF determinant		Effect on NPV
• Extended building lifespan	Holding period	↑	0
• Increased design and planning costs	Initial investment	↑	–
• Increased other professional fees (i.e. zoning)			
• Increased construction costs			
• Reduced long-term vacancy risk	Vacancy rate	↓	+
• Sustainability premium on rent	Potential rent income	↑	+

Effects on DCF model



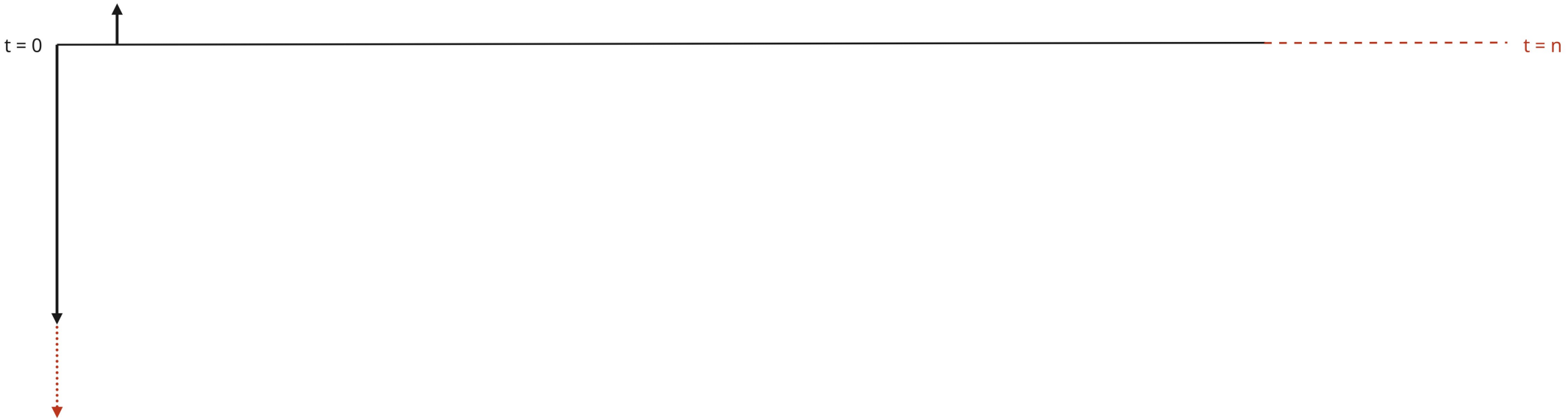
Effects on DCF model

Costs and benefits convertibility	Effect on DCF determinant		Effect on NPV
• Extended building lifespan	Holding period	↑	0
• Increased design and planning costs	Initial investment	↑	–
• Increased other professional fees (i.e. zoning)			
• Increased construction costs			
• Reduced long-term vacancy risk	Vacancy rate	↓	+
• Sustainability premium on rent	Potential rent income	↑	+
• Loss of usable floor space	Potential rent income	↓	–
• Reduced space efficiency			

Effects on DCF model

Decrease annual rent income

Loss of floor space and space efficiency

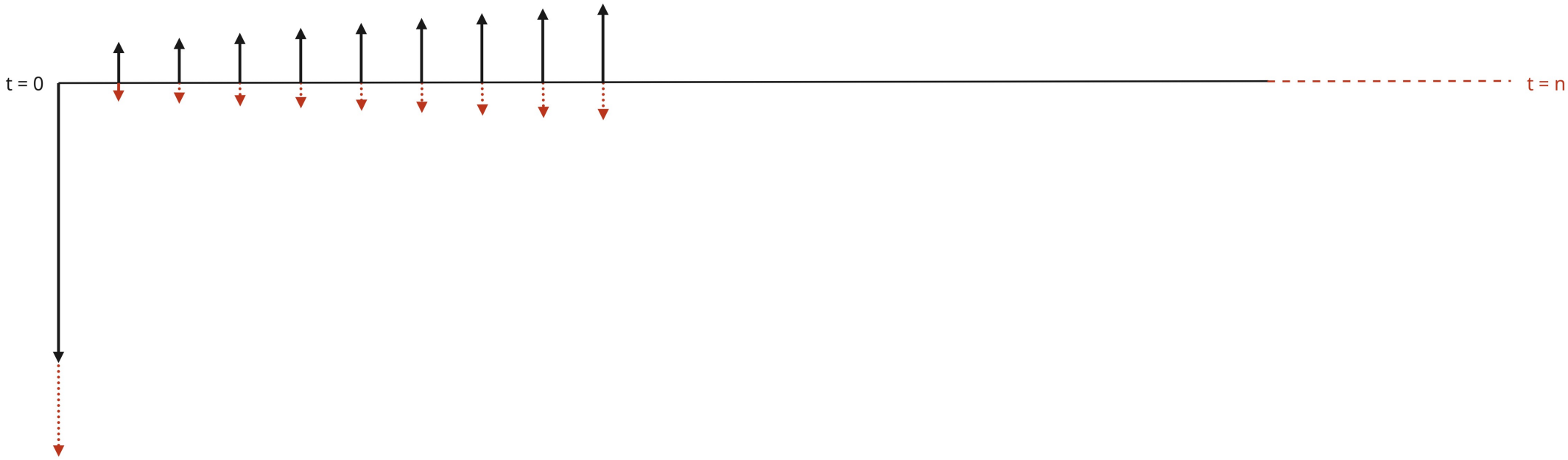


Effects on DCF model

Costs and benefits convertibility	Effect on DCF determinant		Effect on NPV
• Extended building lifespan	Holding period	↑	0
• Increased design and planning costs • Increased other professional fees (i.e. zoning) • Increased construction costs	Initial investment	↑	–
• Reduced long-term vacancy risk	Vacancy rate	↓	+
• Sustainability premium on rent	Potential rent income	↑	+
• Loss of usable floor space • Reduced space efficiency	Potential rent income	↓	–
• Reduced maintenance costs	Operating expenses	↓	+
• Reduced long-term investment risk	Financing costs	↓	+
• Potential tax concessions	Tax liability	↓	+

Effects on DCF model

Effects on DCF model



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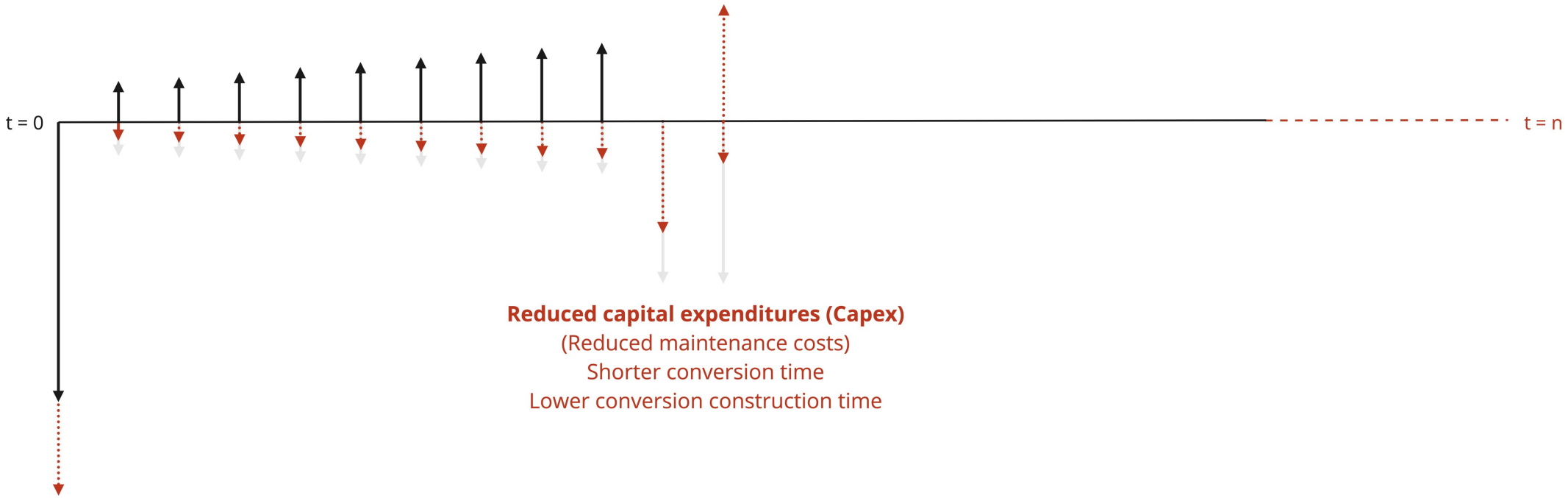
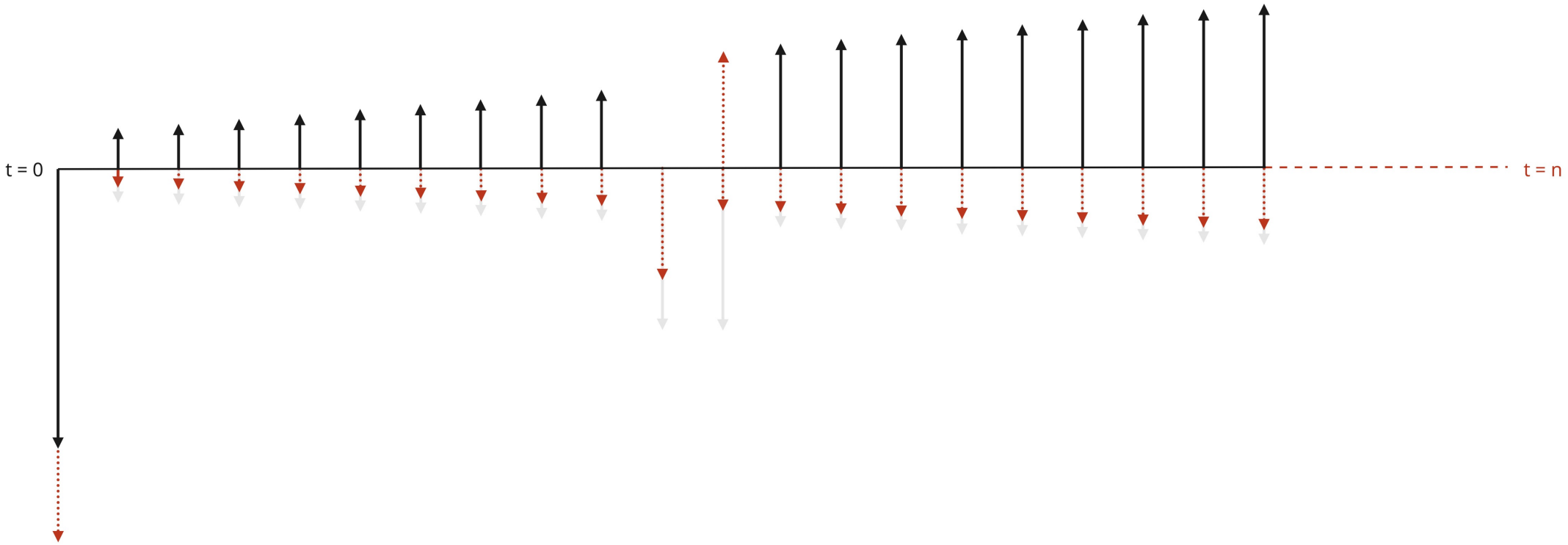
• Loss of usable floor space • Reduced space efficiency	Potential rent income	↓	–
• Reduced maintenance costs	Operating expenses	↓	+
• Reduced long-term investment risk	Financing costs	↓	+
• Potential tax concessions	Tax liability	↓	+
• Reduced maintenance costs	Capital expenditures	↓	+
• Shorter conversion time • Lower conversion construction costs	Capital expenditures	↓	(+)

Final framework

Effects on DCF model



Effects on DCF model



Effects on DCF model

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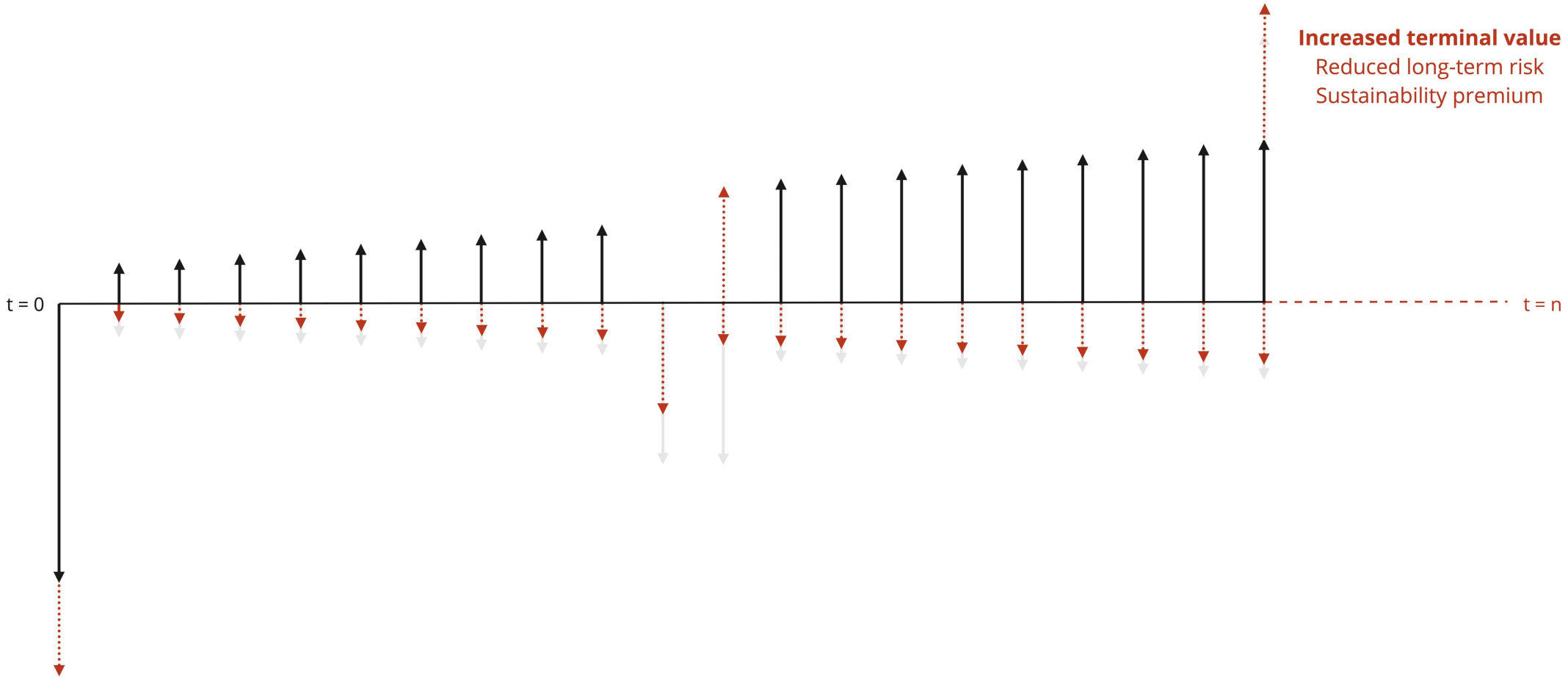
• Loss of usable floor space • Reduced space efficiency	Potential rent income	↓	–
• Reduced maintenance costs	Operating expenses	↓	+
• Reduced long-term investment risk	Financing costs	↓	+
• Potential tax concessions	Tax liability	↓	+
• Reduced maintenance costs	Capital expenditures	↓	+
• Shorter conversion time • Lower conversion construction costs	Capital expenditures	↓	(+)
• Reduced long-term investment risk • Sustainability premium on sale	Terminal value	↑	+

Final framework

Effects on DCF model



Effects on DCF model

Costs and benefits convertibility	Effect on DCF determinant		Effect on NPV
• Extended building lifespan	Holding period	↑	0
• Increased design and planning costs • Increased other professional fees (i.e. zoning) • Increased construction costs	Initial investment	↑	–
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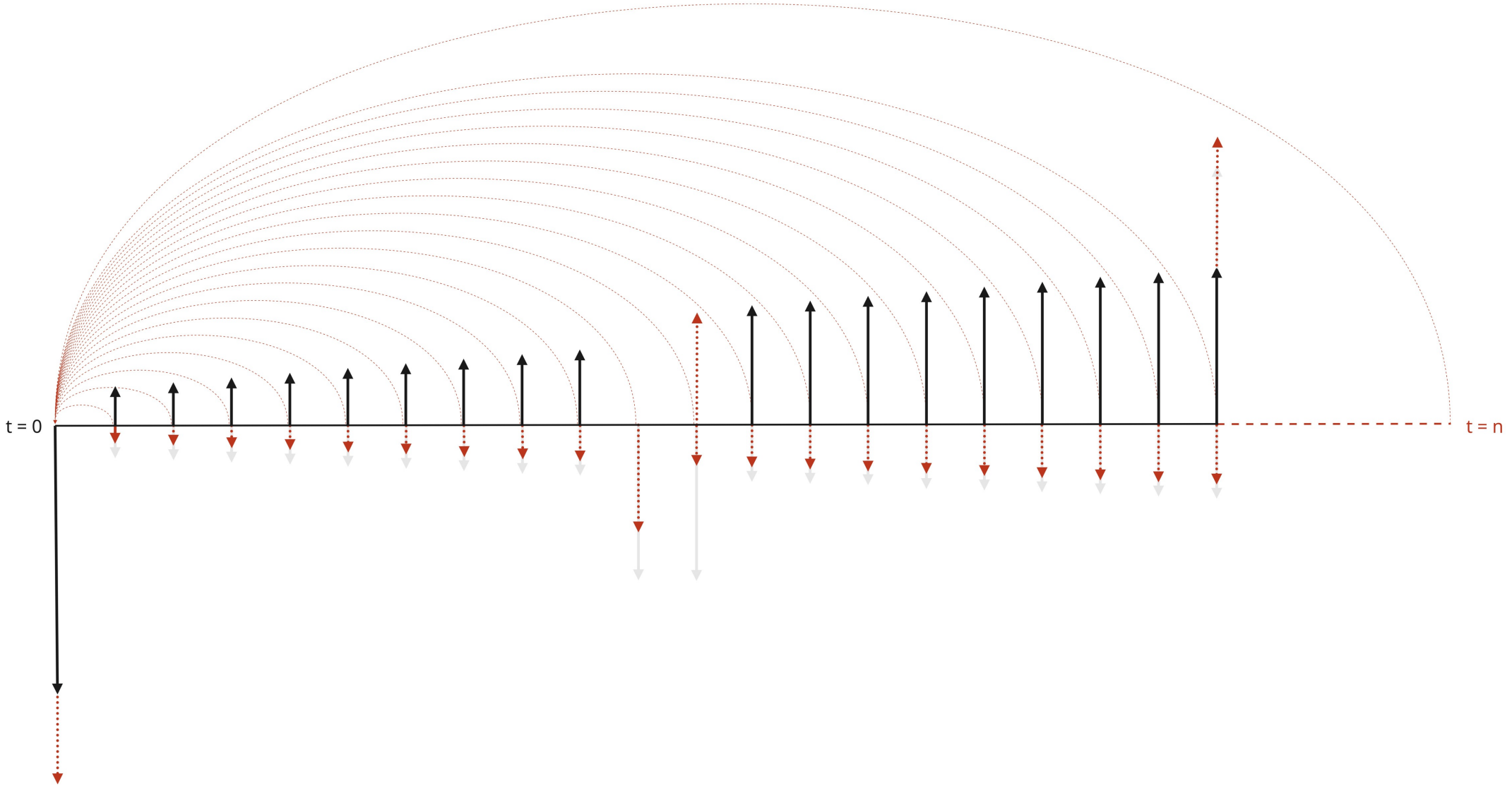
• Sustainability premium on rent	Potential rent income	↑	+
• Loss of usable floor space • Reduced space efficiency	Potential rent income	↓	–
• Reduced maintenance costs	Operating expenses	↓	+
• Reduced long-term investment risk	Financing costs	↓	+
• Potential tax concessions	Tax liability	↓	+
• Reduced maintenance costs	Capital expenditures	↓	+
• Shorter conversion time • Lower conversion construction costs	Capital expenditures	↓	(+)
• Reduced long-term investment risk • Sustainability premium on sale	Terminal value	↑	+
• Reduced long-term investment risk	Discount rate	↓	+

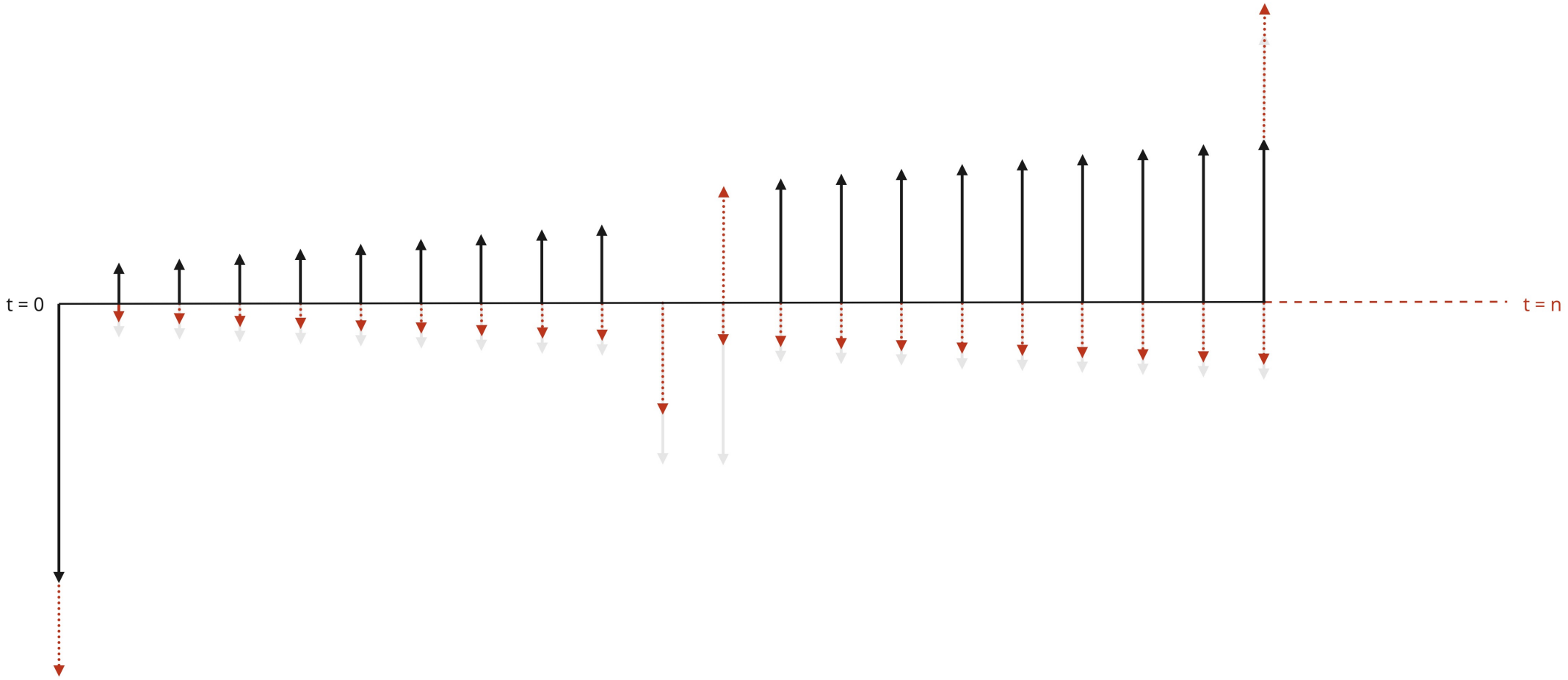
Final framework

Findings

Lower discount rate
Reduced long-term risk



Effects on DCF model



Adoption in practice

Adoption in practice

- Possible barriers to adoption
  - Investment horizon and split incentive
  - Time-value-of-money
  - Uncertainty (market risk)
  - Investment profiles
  - Valuation practices
  - Reluctance towards new practices

Adoption in practice

- Possible drivers of adoption
  - Market flexibility and risk
  - Shifting focus on sustainability (ambition green portfolio)
  - Regulatory drivers

Findings
Sensitivity analysis

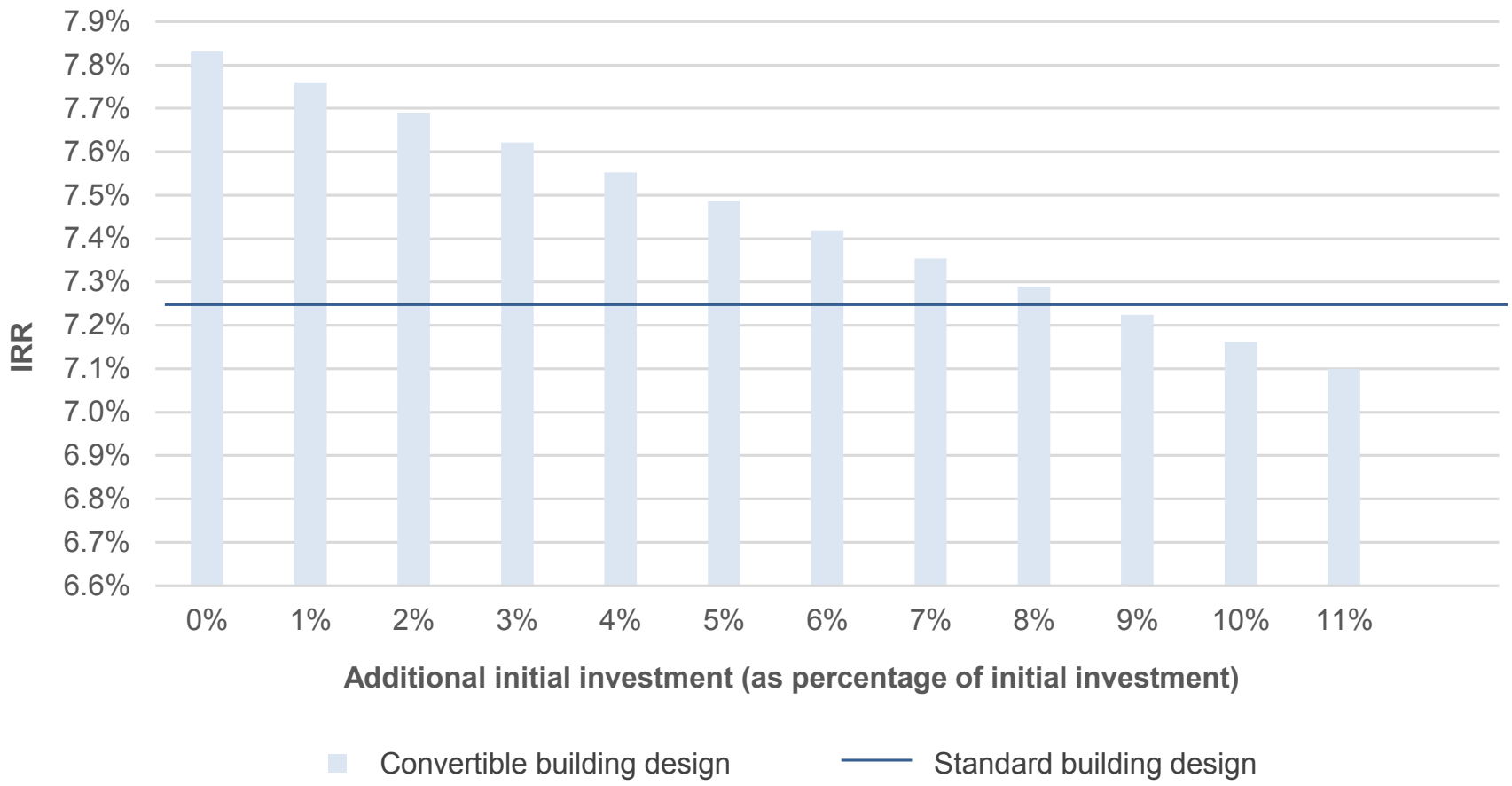
Sensitivity analysis

- Additional initial investment
- Conversion costs
- Gross exit yield (GEY)

Sensitivity analysis

- Additional initial investment

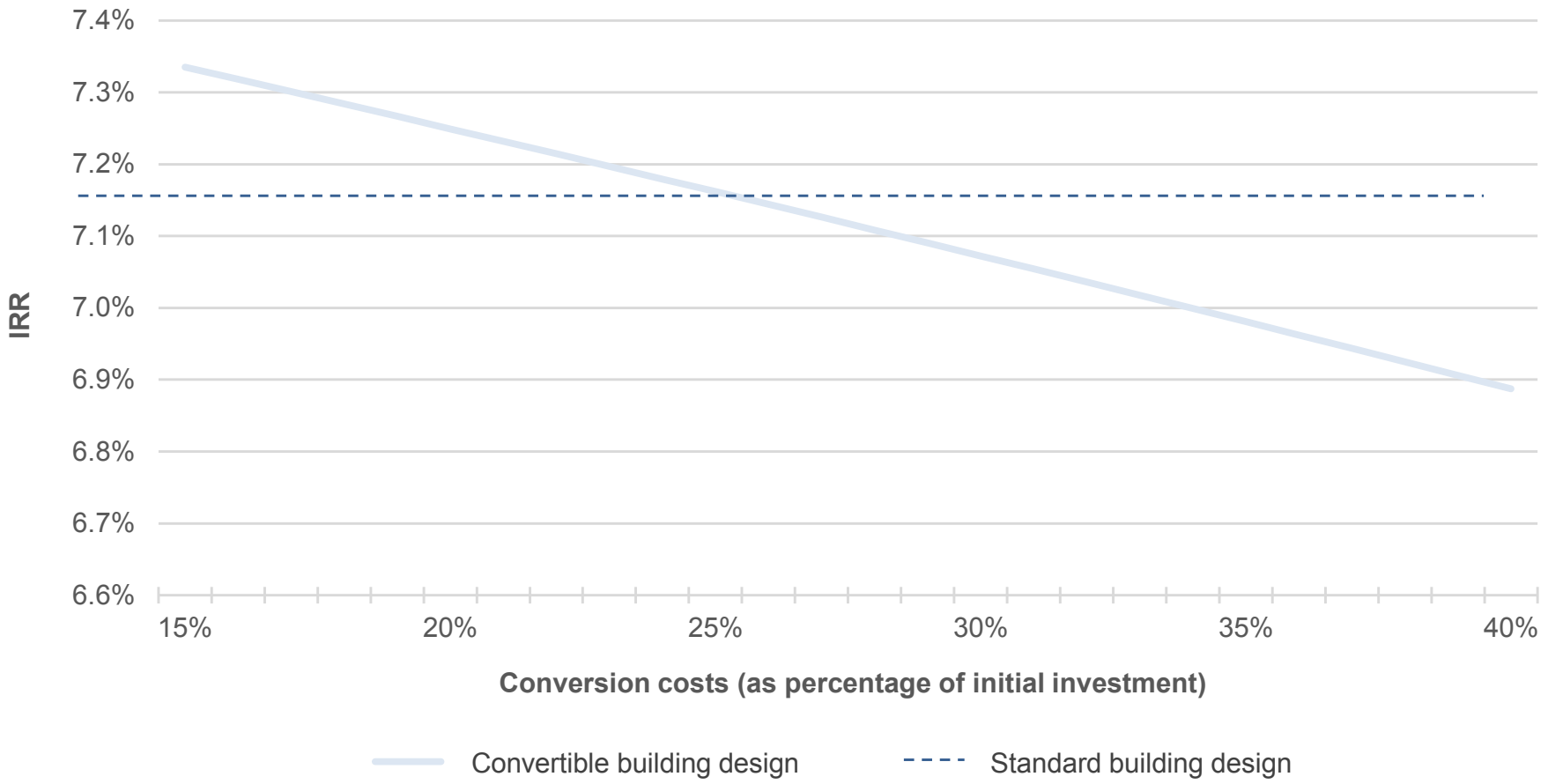
Sensitivity analysis



Sensitivity analysis

- Conversion costs

Sensitivity analysis



Discussion

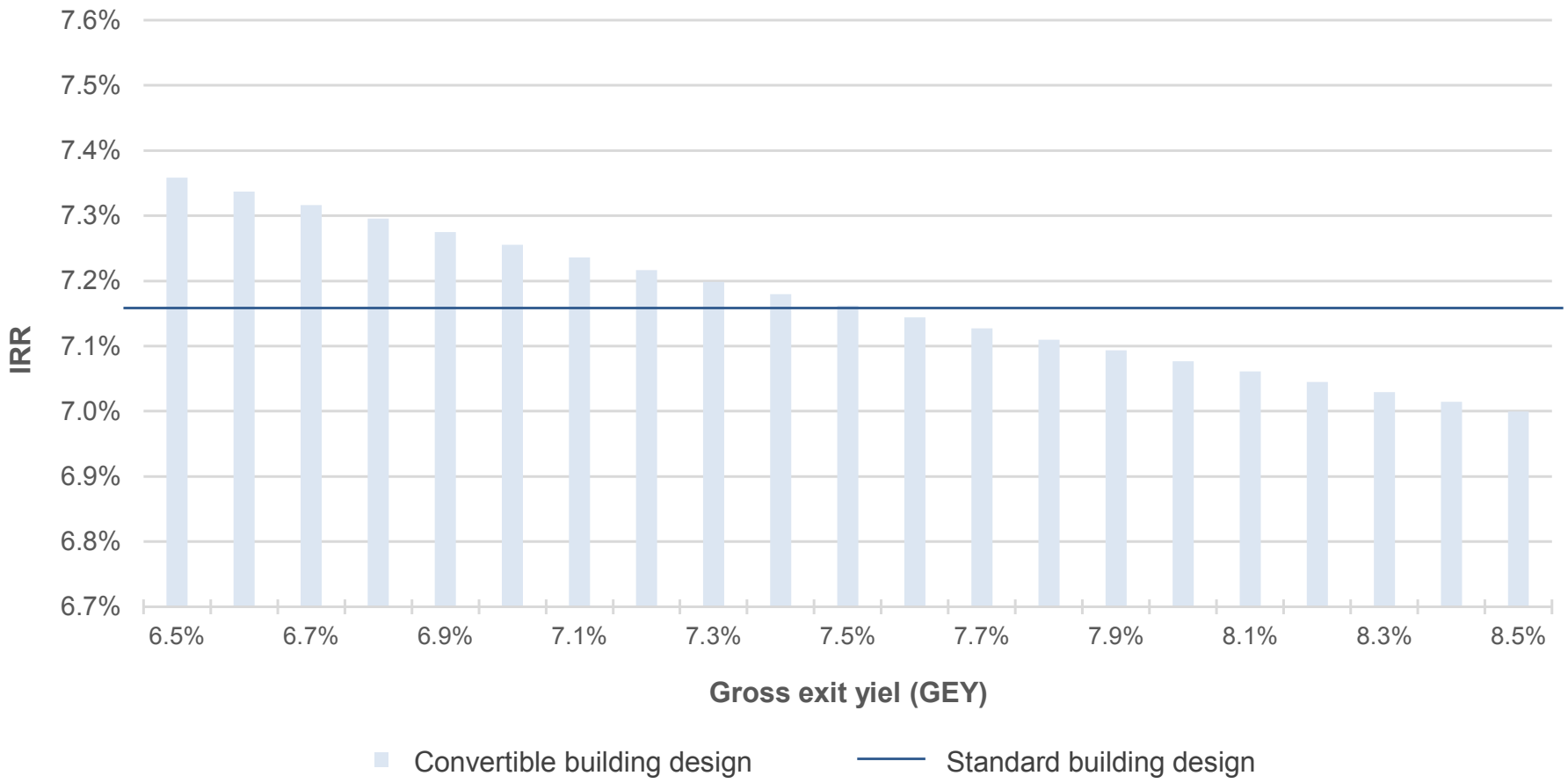
Discussion

- Investor types
  - Long-term or short-term investment profile?
- Perspectives on zoning
  - Chance or challenge?
- Sustainability premiums
  - Theoretical value or real value?

Sensitivity analysis

- Gross exit yield (GEY)

Sensitivity analysis



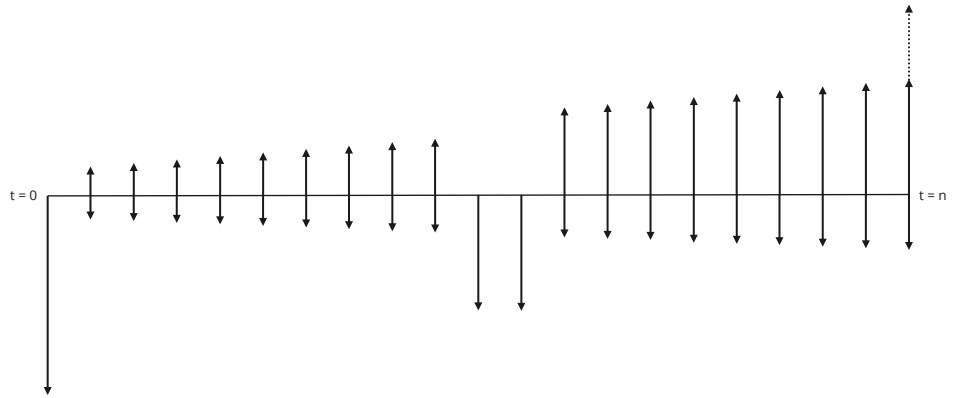
Conclusion

Conclusion

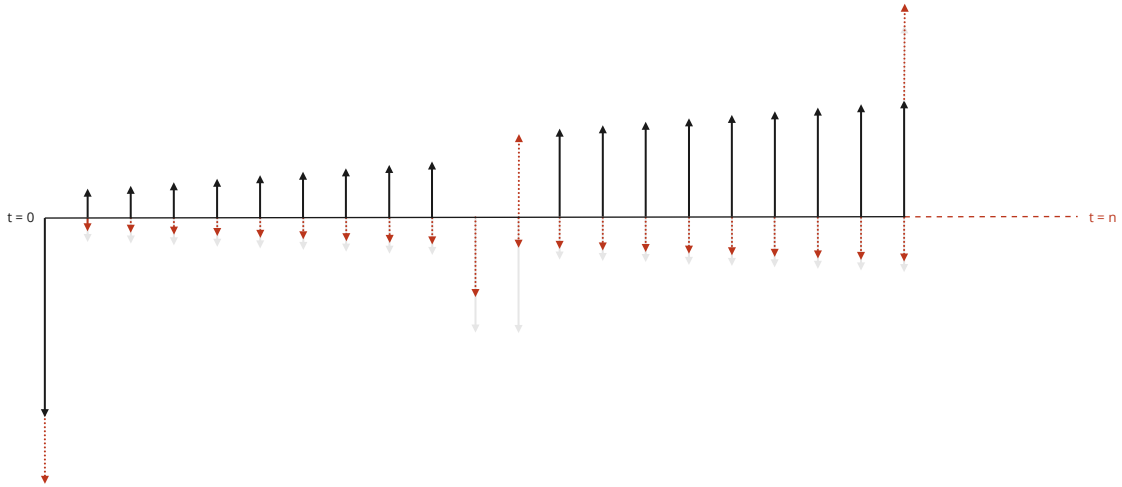
Conclusion

How does the design of a new office building for future residential conversion affect its financial feasibility?

Conclusion



DCF model standard building



DCF model convertible building

Conclusion

How does the design of a new office building for future residential conversion affect its financial feasibility?

- Balance between immediate costs and potential future benefits

Conclusion

How does the design of a new office building for future residential conversion affect its financial feasibility?

- Balance between immediate costs and potential future benefits
  - Costs: additional initial investment, loss of usable floor space

Conclusion

How does the design of a new office building for future residential conversion affect its financial feasibility?

- Balance between immediate costs and potential future benefits
  - Costs: additional initial investment, loss of usable floor space
  - Benefits: reduction of long-term risk, increased sustainability

Conclusion

How does the design of a new office building for future residential conversion affect its financial feasibility?

- Balance between immediate costs and potential future benefits
  - Costs: additional initial investment, loss of usable floor space
  - Benefits: reduction of long-term risk, increased sustainability
- Increase in additional initial investment around 108%

Conclusion

How does the design of a new office building for future residential conversion affect its financial feasibility?

- Balance between immediate costs and potential future benefits
  - Costs: additional initial investment, loss of usable floor space
  - Benefits: reduction of long-term risk, increased sustainability
- Increase in additional initial investment around 108%
- Increase in conversion costs around 25%

Conclusion

How does the design of a new office building for future residential conversion affect its financial feasibility?

- Balance between immediate costs and potential future benefits
  - Costs: additional initial investment, loss of usable floor space
  - Benefits: reduction of long-term risk, increased sustainability
- Increase in additional initial investment around 108%
- Increase in conversion costs around 25%
- Dependence of benefits on conversion
  - Not confirmed

Conclusion

Costs and benefits of convertibility	Effect on DCF determinant		Effect on NPV
• Increased design and planning costs • Increased other professional fees • Increased construction costs	Initial investment	↑	–
• Sustainability premium on rent	Potential rent income	↑	+
• Loss of usable floor space • Reduced space efficiency	Potential rent income	↓	–
• Reduced long-term vacancy risk	Vacancy allowance	↓	+
• Reduced maintenance costs	Operating expenses	↓	+
• Shorter conversion time • Lower conversion construction costs • Reduced maintenance costs	Capital expenditures	↓	(+)
• Reduced long-term investment risk	Financing costs	↓	+
• Potential tax concessions	Tax liability	↓	+
• Reduced long-term investment risk • Sustainability premium on sale	Terminal value	↑	+
• Extended building lifespan	Holding period	↑	0
• Reduced long-term investment risk	Discount rate	↓	+

Final framework

Conclusion

How does the design of a new office building for future residential conversion affect its financial feasibility?

- Balance between immediate costs and potential future benefits
  - Costs: additional initial investment, loss of usable floor space
  - Benefits: reduction of long-term risk, increased sustainability
- Increase in additional initial investment around 108%
- Increase in conversion costs around 25%
- Dependence of benefits on conversion
  - Not confirmed
- Ultimately, dependence on assumptions and interpretation

References

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