BENEFITS OF PHASING

Quantifying the Benefits of Phasing as a Corporate Real Estate Strategy

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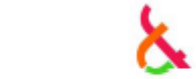

This presentation

- Phasing as a real estate construction strategy – the problem setup
- Some examples from the real world - background
- Numerical case and comparison of strategies – proposed solution
- Discussion & Conclusions

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Phasing as a construction strategy

- Basic notion: it is possible to build buildings in stages
- Building in a way that allows the construction to be continued later usually has an EXTRA cost – compared to building without the possibility to continue construction.
- The idea is that at first a building is built only to reflect the present need for space and IF the need increses more space is built later => flexibility to expand is not built immediately (no ”empty” spaces are built)
- Basic notion: Creating the possibility to continue construction is creating a real option
- The creation of the real option to continue construction to the first phase costs EXTRA, the EXTRA cost is the price of the real option

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Phasing as a construction strategy

- ”The million dollar questions”:
  - What is the value of the real option to construct in phases?
  - Should we construct in phases or not? Is the cost of the real option more than the value?
- To answer these questions we need to be able to value the different strategies and to be able to compare them
- This means valuing a ”normal” construction project and a construction project with a real option to continue building (staging)

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Staged construction examples

Example from Turku, Finland – Kupittaa Intelligate complex

Intelligate has been planned to include three buildings.

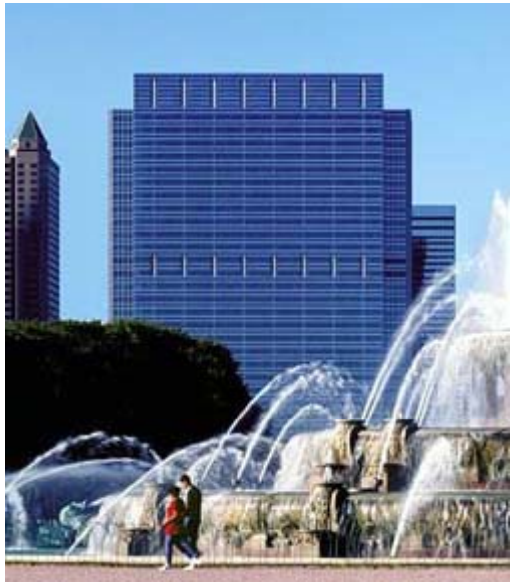
Construction was already stopped once before the first building, and for the second time after the completion of the first building.

Construction will continue IF the demand for spaces Increases.

TURKU, FIN

Staged construction examples

It is also possible to build **high rise** buildings in stages



CHICAGO, USA

JCRE
11,3

146

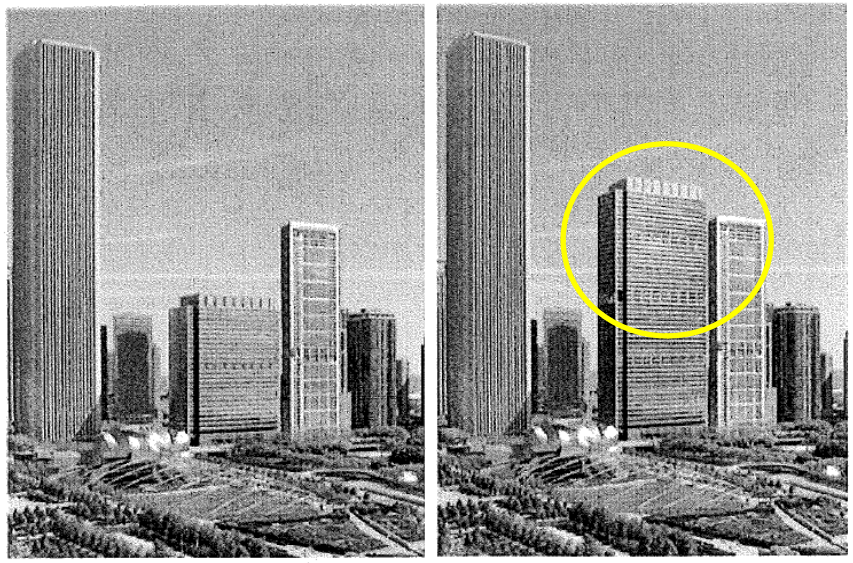


Plate 1.
Health Care Service Corporation building in Chicago in center of image

Note: Phase 1 (left) and Phase 2 (right)
Sources: Goettsch Partners (2008); Pearson and Wittels (2008)

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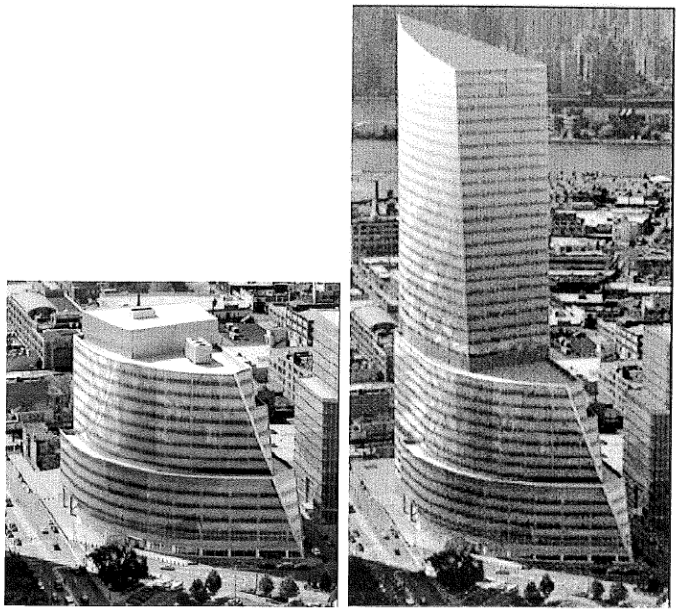
Staged construction examples



Notes: Phase I (left) and Phase II (right)
Sources: Kolin Pedersen Fox (2005); Pearson and Wittels (2008)

Vertical phasing

147

Plate 2.
Court Square Two in New York City

NEW YORK CITY, USA

Staged construction examples

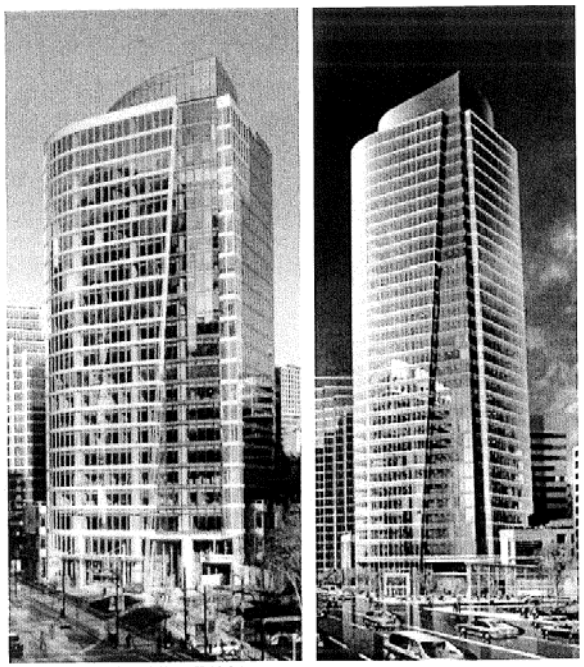


Plate 3.
Bentall Five building in Vancouver

Notes: Phase I (left) and Phase II (right)
Sources: Bentall Capital (2005); Pearson and Wittels (2008)

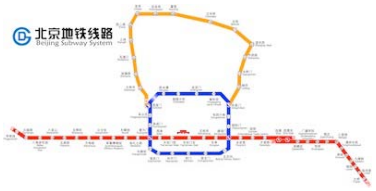
VANCOUVER, CAN

All work was carried out without any interruption to the current building tenants that occupy the existing 22 floors.
As Bentall 5 is situated in downtown Vancouver, the protection of the neighboring buildings and the safety of the general public were of utmost importance to the EllisDon construction team.
From: http://ascribehq.com/ellisdon/portfolio/4730

Staged construction examples

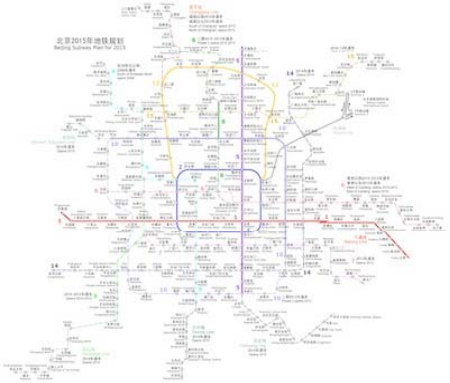
- In city centers: the more central you are the more you pay for the land and the right to build
- When cities grow, and when or if you can build on the same spot it is highly likely that the land price is much higher and you make money just by ”already being there”
- Additionally there are savings connected to not having to move the operations (if it is your own organizations’ premises that are built)

BEIJING, PRC



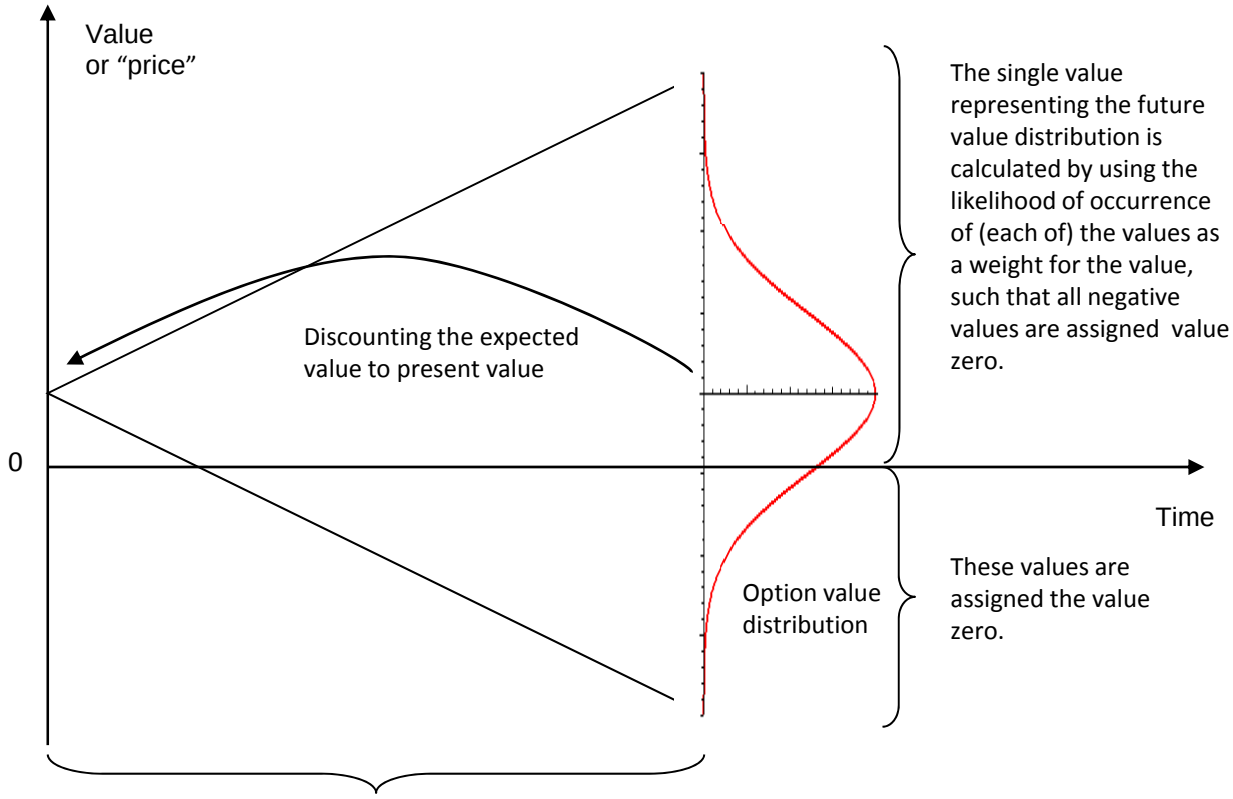
Beijing subway map 2006

Beijing subway map 2008



Beijing subway map 2011

The logic of real option valuation



Real Options as a Modeling problem

The three major components of modeling the value of a real option are:

a) the modeling of the future value distribution

b) the calculation of the expected value of the future value distribution while mapping negative values of the distribution zero, and

c) modeling the calculation of the present value of the expected value.

Numerical Case

- The problem resembles the (well known) decision problems often found in R&D projects
- As with R&D projects, there is a lot of uncertainty also in construction project outcomes: these projects are well known for cost overruns (cost side uncertainty) and the revenues are also uncertain (market dependency)
- We use cash-flow scenarios to frame the uncertainty in the projects: best guess, minimum possible, and maximum possible scenarios are built for costs and for revenues (3 scenarios)

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Building Strategy 1: Build in one phase

Time (t)	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Cost Cashflows (in 100,000s)																
optimistic	962,2	966,3														
best guess	1012	996	88													
pessimistic	1000	1000	350													
PV of the cost					rd=	4,00 %										
optimistic	962,20	929,13	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
best guess	1012,00	961,60	81,36	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
pessimistic	1000,00	961,54	323,59	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Revenue source 1: long term leases (in 100,000s)																
optimistic	0,00	20,00	220,00	226,60	233,40	240,40	247,61	255,04	262,69	270,57	278,69	287,05	295,66	304,53	313,67	323,08
best guess	0,00	0,00	180,00	197,00	200,94	204,96	209,06	213,24	217,50	221,85	226,29	230,82	235,43	240,14	244,94	249,84
pessimistic	0,00	0,00	150,00	170,00	172,55	175,14	177,77	180,43	183,14	185,89	188,67	191,50	194,38	197,29	200,25	203,26
Revenue source 2: shorter term leases (in 100,000s)																
optimistic	0,00	10,00	110,00	114,40	118,98	123,74	128,68	133,83	139,19	144,75	150,54	156,56	162,83	169,34	176,11	183,16
best guess	0,00	0,00	75,00	85,00	86,70	88,43	90,20	92,01	93,85	95,72	97,64	99,59	101,58	103,61	105,69	107,80
pessimistic	0,00	0,00	40,00	45,00	50,00	50,75	51,51	52,28	53,07	53,86	54,67	55,49	56,32	57,17	58,03	58,90
PV of the total positive wealth resulting from strategy					rd=	9,00 %	(it is possible to use separate discount rates for each revenue source)									
optimistic	0	28	278	263	250	237	224	213	202	191	181	172	163	155	147	139
best guess	0	0	215	218	204	191	178	167	156	146	137	128	120	112	105	98
pessimistic	0	0	160	166	158	147	137	127	119	110	103	96	89	83	77	72

Net present value of Strategy 1: Building in one phase		Real option value for strategy 1		Possibilistic mean of triangular NPV for strategy 1	
optimistic	950				
best guess	124	ROV	138	Single # NPV	134
pessimistic	-642				

Building Strategy 2: Build in two phases

Time (t)	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Cost Cashflows: phase 1 (in 100,000s)																
optimistic	991,066															
best guess	1062,6	46,2														
pessimistic	1100	192,5														
Cost Cashflows: phase 2 (in 100,000s)																
optimistic	0	0	0	0	0	975	0	0	0	0	0	0	0	0	0	0
best guess	0	0	0	0	0	1080	0	0	0	0	0	0	0	0	0	0
pessimistic	0	0	0	0	0	1200	0	0	0	0	0	0	0	0	0	0
PV of the cost					rd=	4,00 %										
optimistic	991,07	0,00	0,00	0,00	0,00	801,38	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
best guess	1062,60	44,42	0,00	0,00	0,00	887,68	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
pessimistic	1100,00	185,10	0,00	0,00	0,00	986,31	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Revenue source 1: long term leases (in 100,000s)																
optimistic	0,00	165,00	169,95	175,05	180,30	185,71	400,00	412,00	424,36	437,09	450,20	463,71	477,62	491,95	506,71	521,91
best guess	0,00	115,00	150,00	153,00	156,06	159,18	320,00	326,40	332,93	339,59	346,38	353,31	360,37	367,58	374,93	382,43
pessimistic	0,00	110,00	130,00	131,95	133,93	135,94	300,00	304,50	309,07	313,70	318,41	323,19	328,03	332,95	337,95	343,02
Revenue source 2: shorter term leases (in 100,000s)																
optimistic	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
best guess	0,00	14,00	17,00	17,34	17,69	18,04	30,00	30,60	31,21	31,84	32,47	33,12	33,78	34,46	35,15	35,85
pessimistic	0,00	9,00	35,00	35,53	36,06	36,60	45,00	45,68	46,36	47,06	47,76	48,48	49,20	49,94	50,69	51,45
PV of the total positive wealth resulting from strategy					rd=	9,00 %	(it is possible to use separate discount rates for each revenue source)									
optimistic	0	151	143	135	128	121	259	225	213	201	190	180	170	160	152	143
best guess	0	118	141	132	123	115	209	195	183	171	160	150	140	131	123	115
pessimistic	0	109	139	129	120	113	206	192	178	166	155	144	134	125	116	108

Net present value of Strategy 2: Building in two phases		Real option value for strategy 2		Possibilistic mean of triangular NPV for strategy 2	
optimistic	759				
best guess	210	ROV	232	Single # NPV	244
pessimistic	-137				

Cost cash flows in one and in two stages

”excel compatible”

Scenario NPV’s

Separate discount rates for costs and for revenues

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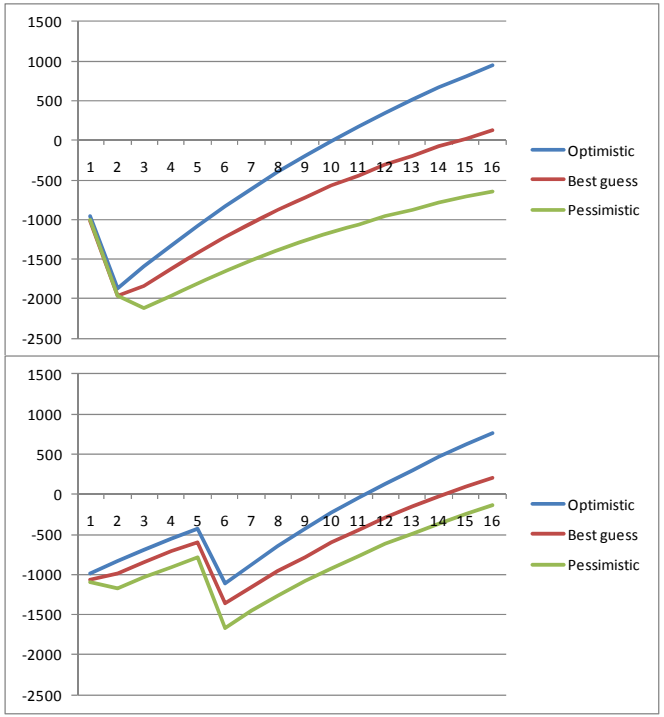
Nominal value of costs

	Strategy 1: one phase	Strategy 2: two phases	Cost of real option
Optimistic	1928,50	1966,07	37,57
Best guess	2096,00	2188,80	92,80
Pessimistic	2350,00	2492,50	142,50

Present value of costs

	Strategy 1: one phase	Strategy 2: two phases	Cost of real option
Optimistic	1891,33	1792,44	-98,89
Best guess	2051,05	1994,70	-56,35
Pessimistic	2285,13	2271,41	-13,72

With the numbers used an unexpected result occurred:
the present value of real option cost is negative!
Explanation: As the time value of money-effect ”kicks-in” the postponing of the second phase alone is enough to justify staging!



Cumulative PV of the construction project with one / two stages

Observe two things:

1) How close the scenarios are to each other (inaccuracy of estimation)
2) How low the min scenario goes (most negative perceived outcome)

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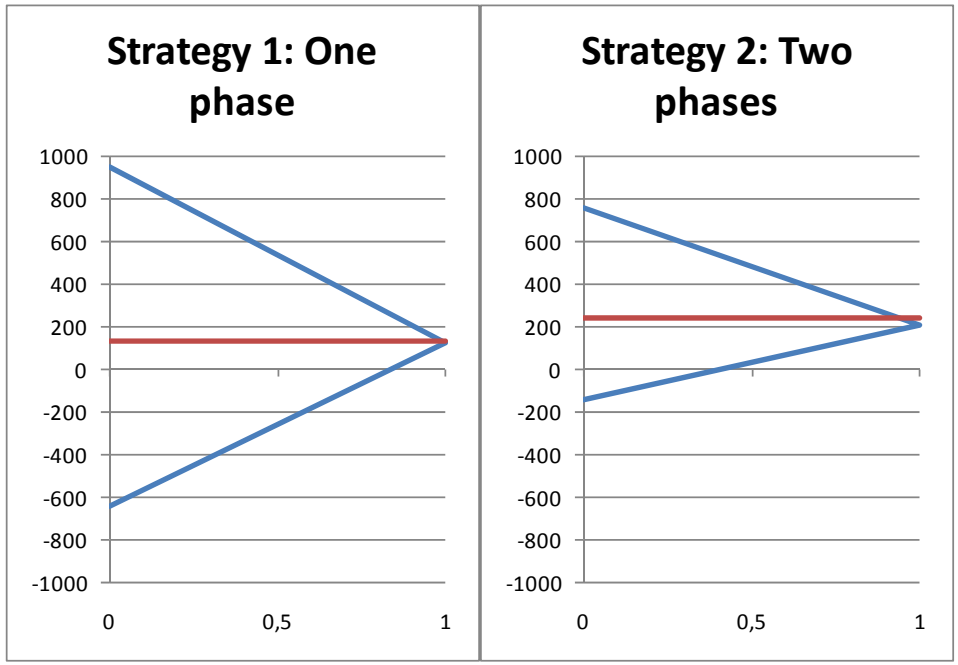
	Strategy 1 One phase	Strategy 2 Two phases
Optimistic NPV	950	759
Best guess NPV	124	210
Pessimistic NPV	-642	-137
Mean NPV	134	244
Real Option Value	138	232
"Risk factor"	325	183
"Risk factor" %	263 %	87 %
"Success factor"	66/100	95/100

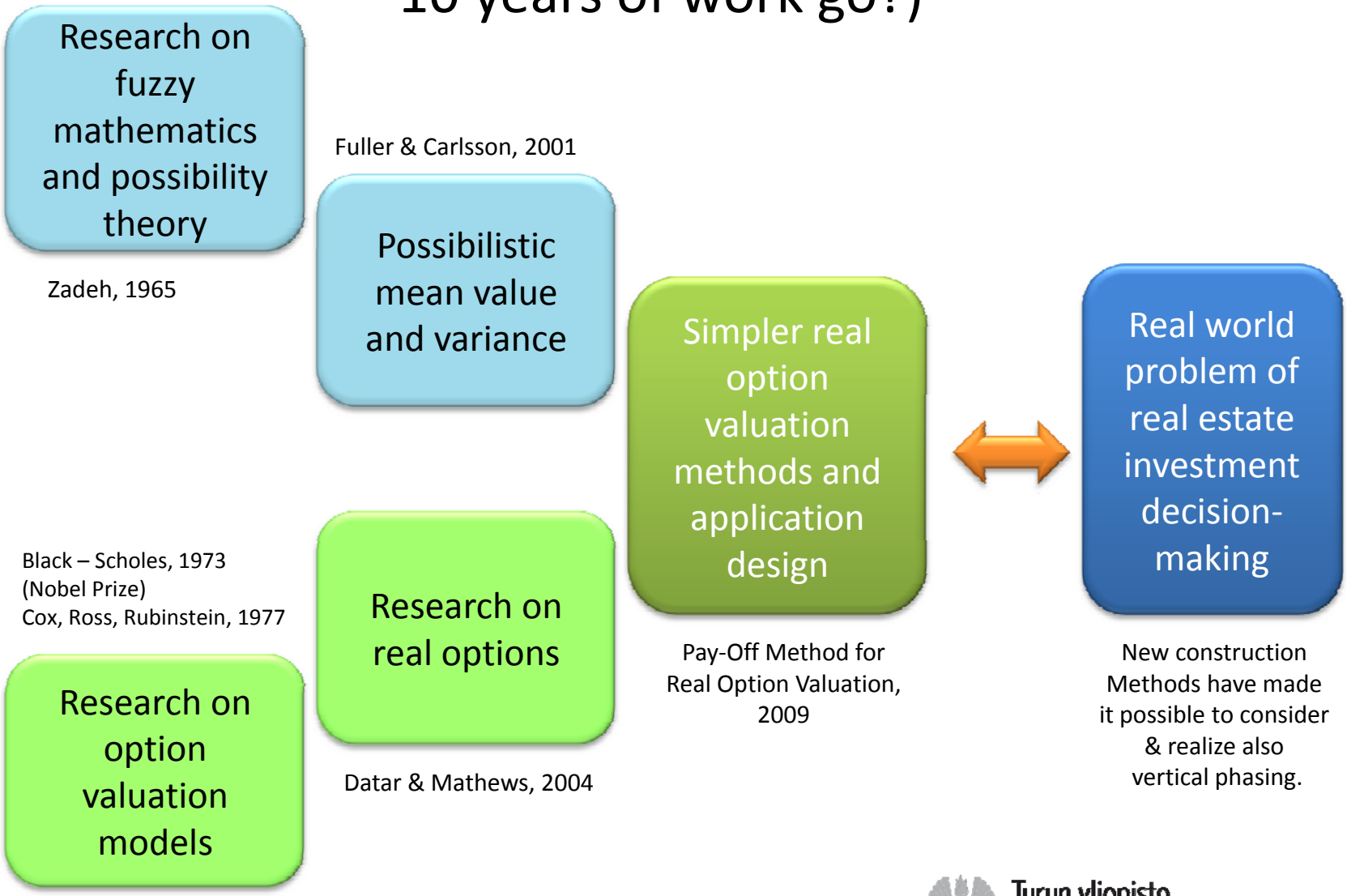
This table shows single number descriptive numbers about the two strategies. Numbers on the light background are ”better”
- Usefull for comparison of strategies

This kind of ”numbers” are very good for e.g. MCDM => We know, but we sometimes don’t use what we know!



Creation of a pay-off distribution from the scenario values allows The decision-maker to visually compare the strategies.
The wider the pay-off distribution, the more risky the project seems to be.
Also if the distributions are very asymmetric then the upside and the downside become visible as They are perceived, not as symmetric (as sometimes happens, when e.g.sensitivity analysis is used)

Background & context of this research (where did 10 years of work go?)



Final thoughts / Takeaway message

- Phasing is a relevant alternative for large scale construction
- Staging can be understood as a real option
- Quantifying the value / benefit of staging is relevant from a decision-making point of view – only the quantification reveals if the staging really makes sense
- Graphical presentation increases understanding of the project and the involved risks

Thank You!

Questions? Comments?