MYOPIC SEARCH AND TEMPORALLY DISTANT GOALS

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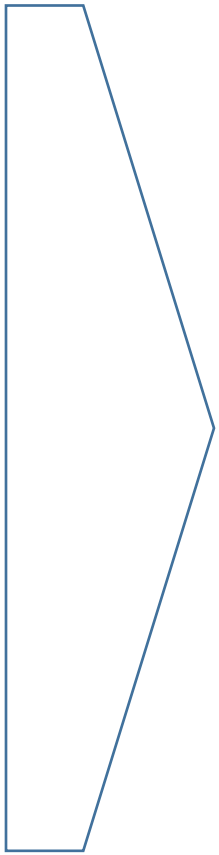
Distant opportunities and myopic search

- BToF: firms as complex systems (Cyert and March 1963, Levinthal and March 1993, Gavetti et al. 2012)
  - Interdependencies: novel opportunities are often distant (many decisions need to change together)
  - Boundedly rational decision making (Simon 1947)
- Need for exploratory search (March 1991)
- Empirical evidence of exploratory outcomes (Rosenkopf & Nerkar 2001, Katila and Ahuja 2002, He & Wong 2004)
- Nevertheless, implementation of discovered distant solutions difficult to observe

Distant opportunities and myopic search

- Firms may discover distant opportunities, which form ***long-term goals*** as decision-making inputs (Simon 1967, Greve 2008)
- However, implementation is often a temporal process of incremental, sequential actions (Chandler 1962, Nadler & Tushman 1989, Yi et al. 2016)
- Consistent with March (1991: 71-73)
  - Exploration as "discovery" and "longer time horizons"
  - Exploitation (local search) as "choice", "implementation" and "execution"



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Exploration as long-term goal discovery and temporal horizon

2

Implementation as boundedly rational execution of goals

Two somewhat decoupled processes

Relationship between exploration of long-term goals and myopic implementation

- Long-term goal as input for local decision making (Simon 1967)
- Temporal myopia (i.e., firm's tendency to ignore the long-term consequences of decisions)
  - Focus on ignoring (compared to not knowing, which is uncertainty)
  - TM = a firm's extent to which it discounts a decision's contribution to a long-term goal
- Little attention paid to relationship between exploration and myopic implementation in the BToF

Role of temporal myopia in decision making over time not well understood

- Generally: temporal myopia discounts long-term value of decisions → settle for suboptimal solutions

→ Typically assumes one-shot commitment choice

Literature on short-termism (e.g., Laverty 1996, Ghemawat 2016)

- However, discounting plays a role in learning and navigating between decisions that are spaced out over time

→ Assumes a series of actions over time

Literature on credit-assignment (Denrell et al. 2004, Holland 1995, Rahmandad 2008, Sutton and Barto 1998)

Studying temporal implementation of exploratory, distant goals

- how does temporal myopia affect the implementation of long-term goals?

- Is temporal myopia affecting outcomes differently for different time horizons of firms' long-term goals?

- How are these relationships different given the task complexity of the problem to solve?

Model Design

Modelling temporal myopia and long-term goals

- *Complex decision problems*: N choices with K interactions among one another

  Determines the decision space (landscape)

- *Temporal horizon:* Breadth of exploration for long-term solutions [measured in the number of temporally distinct steps to reach]

  How many decision-making steps is a goal away?

- *Temporal myopia*: Degree to which a firm discount's a decision's contribution to reaching its long-term goal

  How much "credit" does a decision for the long-term goal

Modelling exploration of distant goals

- Exploration as a temporal search radius (lambda)
- the number of decision changes to achieve
- 00000 vs 11001 (3 decisions away)
- **Long-term goal**: the max available within a firm's temporal horizon (greedy exploration)

Motivational logic of long-term goal: What's theoretically achievable within our firm's planning horizon?

Modelling bounded rationality

- the amount of information available and decisions considered at any given point are limited (Simon 1947)

- Modelled as search for incremental performance improvements (Levinthal 1997, Lant and Mezias 1990, Cyert and March 1963, Nelson and Winter 1982)

- That is, randomly pick one decision change at a time (typical default in NK studies)

Modelling decision making

Evaluating a focal string of decisions (a):

- the firm will consider the decision's immediate performance consequences (Π_s)
- and how this decision will change the temporal distance (*d*) to the long-term goal (Π_l).

$$Q(a) = \Pi_s + (\Pi_l * (1 - m)^d)$$

Analogous to an *objective* positional value in credit assignment
(cf. Sutton & Barto 1998, Denrell et al. 2004)

➔ decision based on short-term feedback (Cyert & March 1963), which here includes a signal about the temporal distance change to a long-term goal

Illustrative example

$$Q = \Pi_s + (\Pi_l * (1 - m)^d)$$

Status quo (s)

0 0 0 0 0

Π_s=0.5

Distance *d*: 3 steps

$$Q(s) = 0.5 + 0.65 * (1 - m)^3$$

Long-term goal

0 0 1 1 1

Π_l=0.65

Distance *d*: 4 steps.

(Alternative (a))

1 0 0 0 0

Π_s=0.53

$$Q(a) = 0.53 + 0.65 * (1 - m)^4$$

Patient firm (e.g., m=0.1) will reject the alternative (Q(s)>Q(a))
Very myopic firm (e.g., m=0.9) will accept the alternative (Q(s)<Q(a))

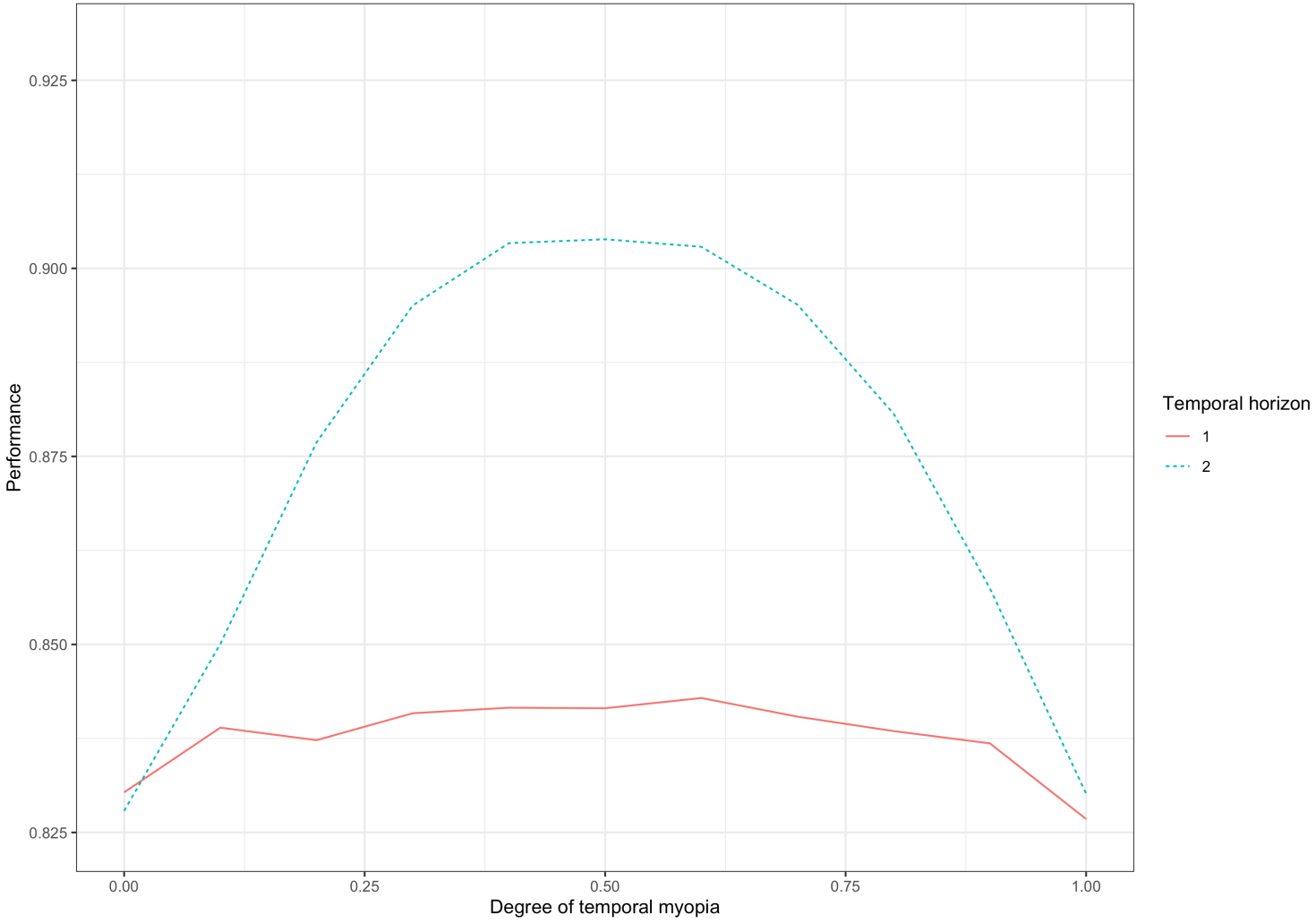
Model parameters & specification

Parameter	Specification
N organizational policies	N=12
Each policy is influenced by K other policies	K={1,6,11} (default K=11, high complexity)
Each possible set of decisions maps onto a unique performance value	following Kauffman (1993) contribution values (cf. (Levinthal 1997, Rivkin 2000, Baumann and Siggelkow (2013))
Temporal horizon (goal discovery)	λ ={1,2,..,11} (default λ =3)
Temporal myopia	m=[0,1] in increments of 0.1
Decision-making attempts	One decision per “time unit”, we report the steady-state of firms (i.e., when no firm improvements can be reached)
Each combination of parameters constitutes a separate experiment	500 firms per experiment, each firm on a uniquely drawn landscape (averages are reported)

Results

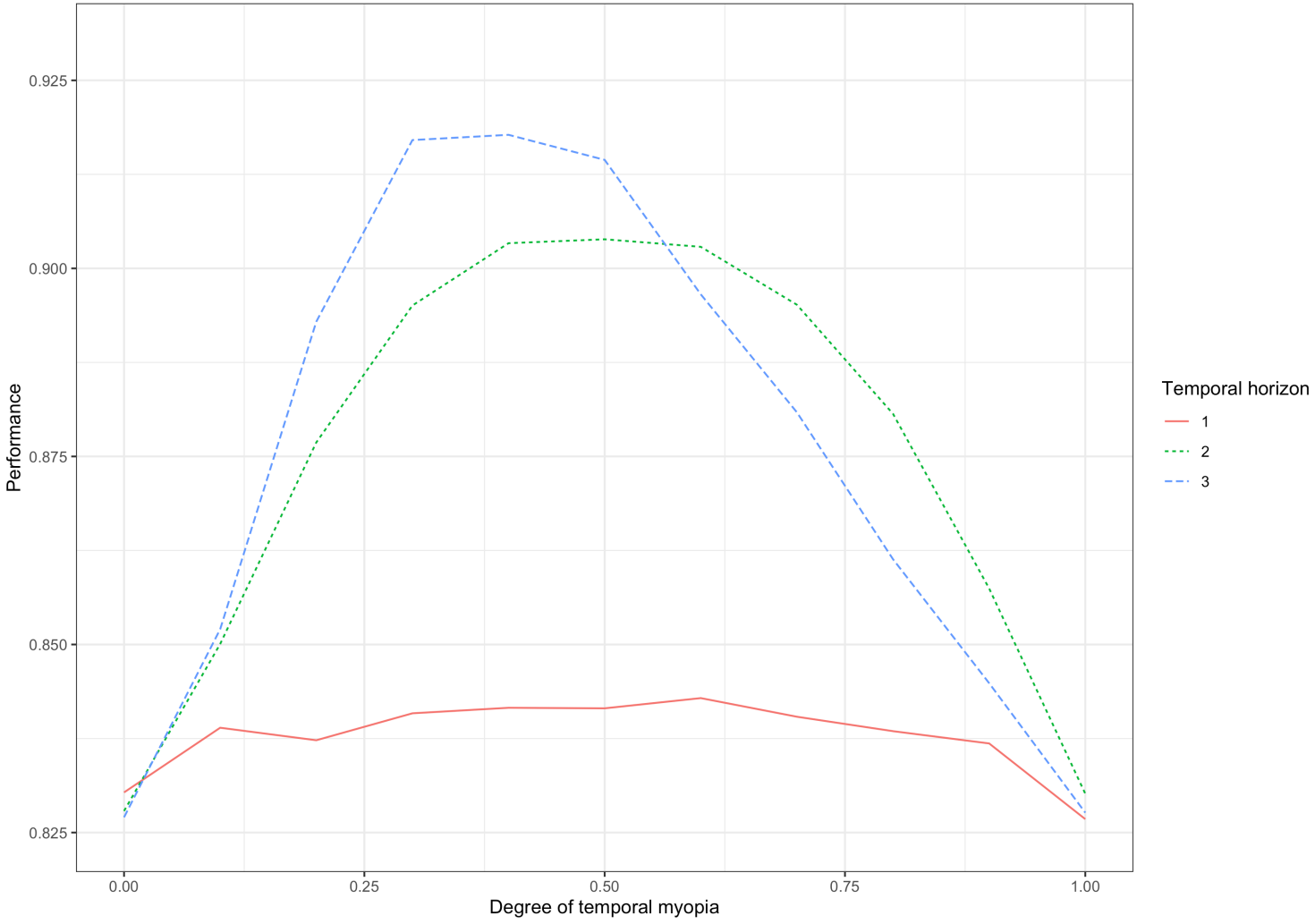
- Some degree of temporal myopia necessary to achieve goals and high performance
- temporal myopia influences how sensitive firms are with respect to evaluating decisions that lead to change in the temporal distance to their long-term goals
- The caveat to this, however, is to match the exploratory horizon, i.e., how distant of goals the firm discovers, with degree of myopia to implement
- These effects are strongest when complexity is high

Steady-state performance



- Complexity high (K=11)
- Performance relative to global peak

Steady-state performance



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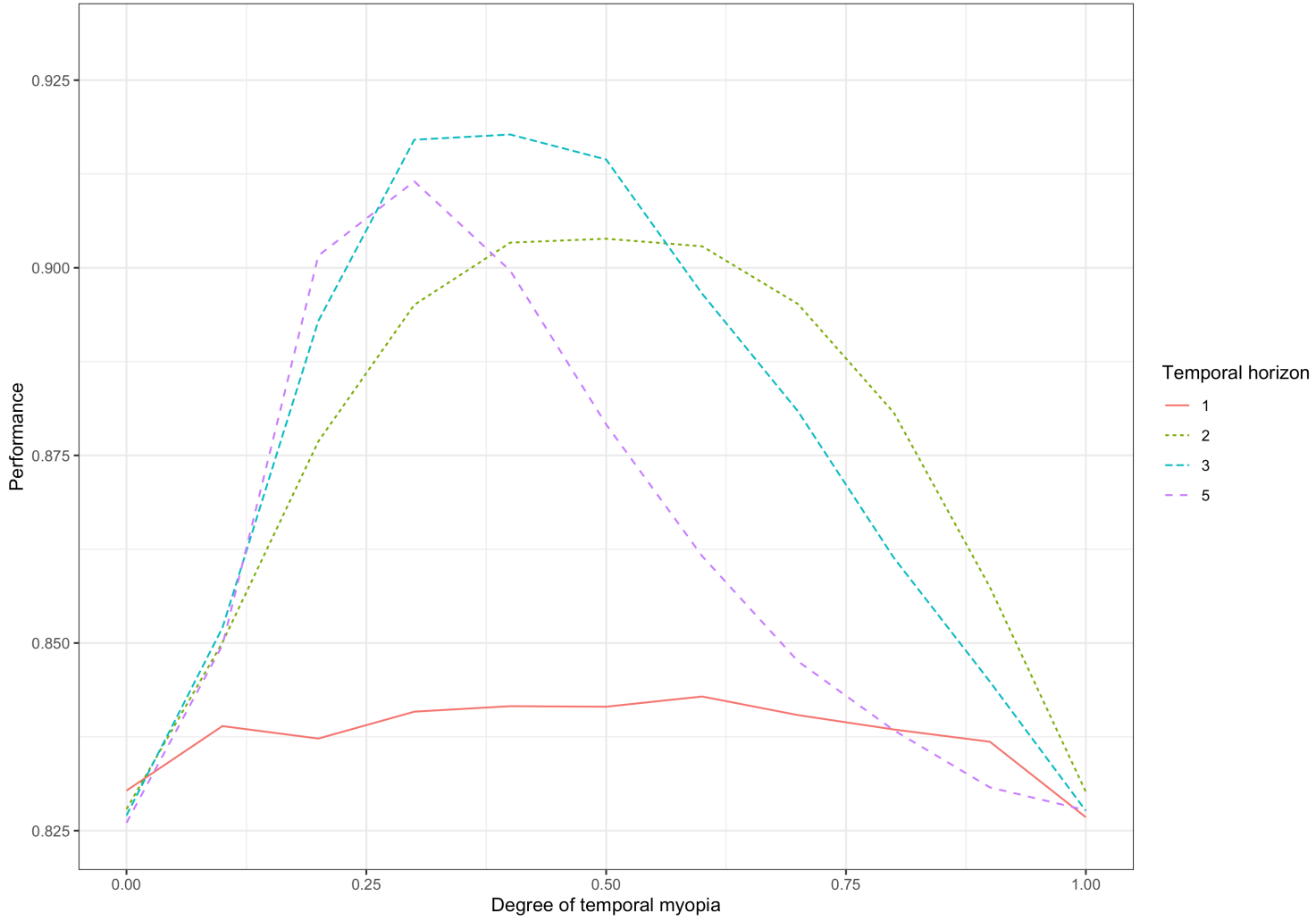

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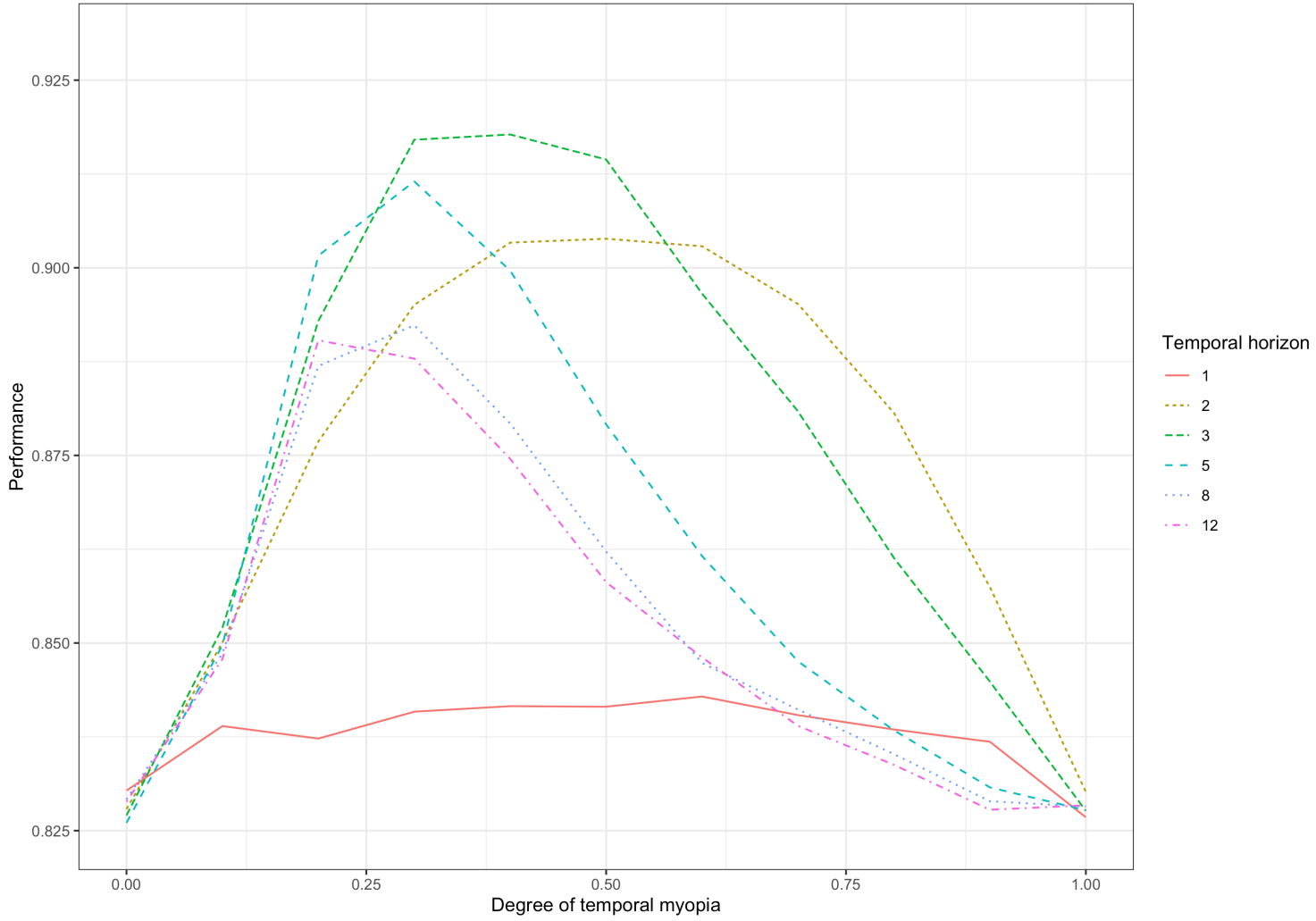

- Complexity high (K=11)
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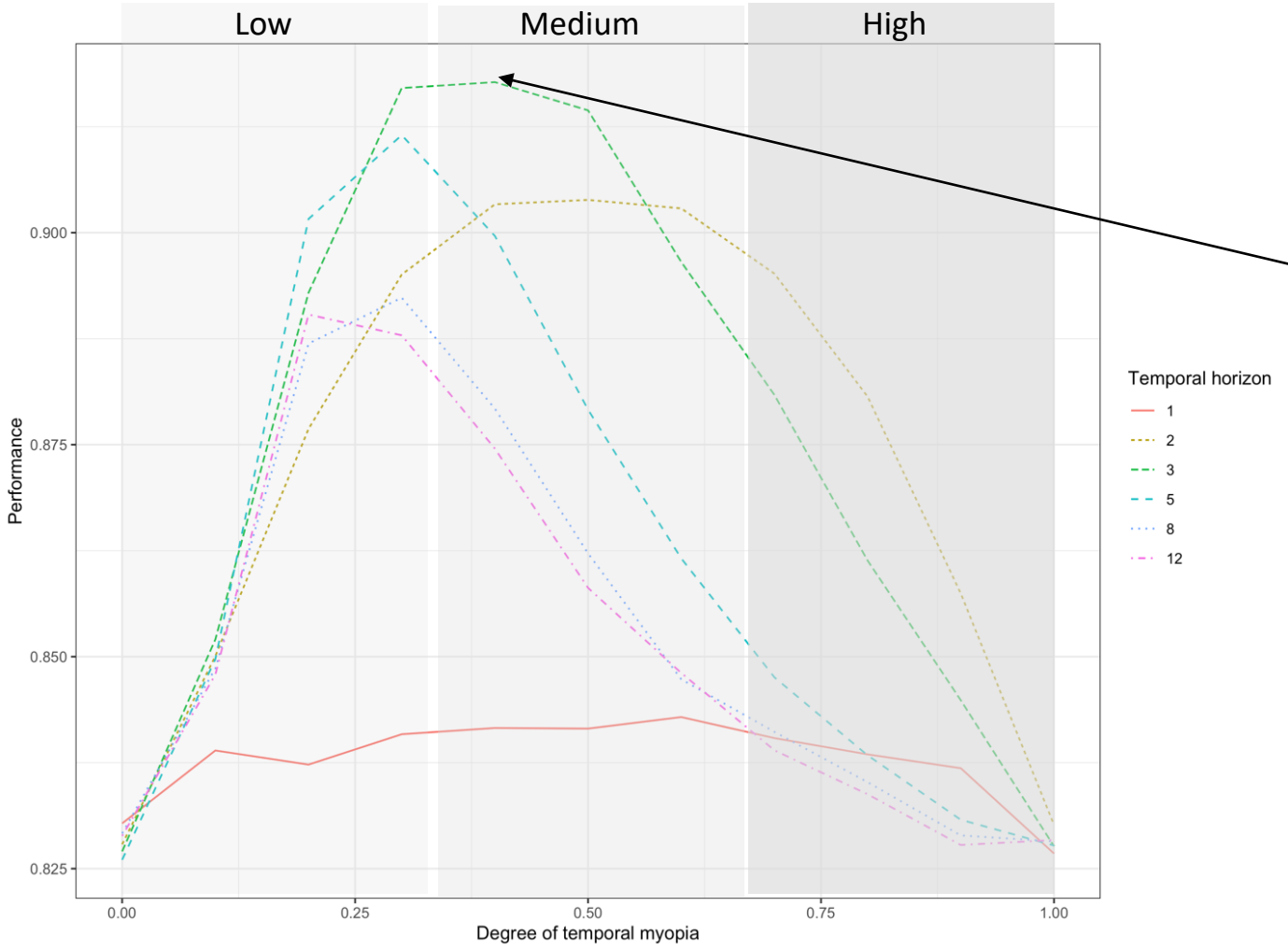
Shorter horizons allow for (or even benefit) from greater temporal myopia



Curvilinear relationship

Greatest performance horizon=3 & *m*=0.4

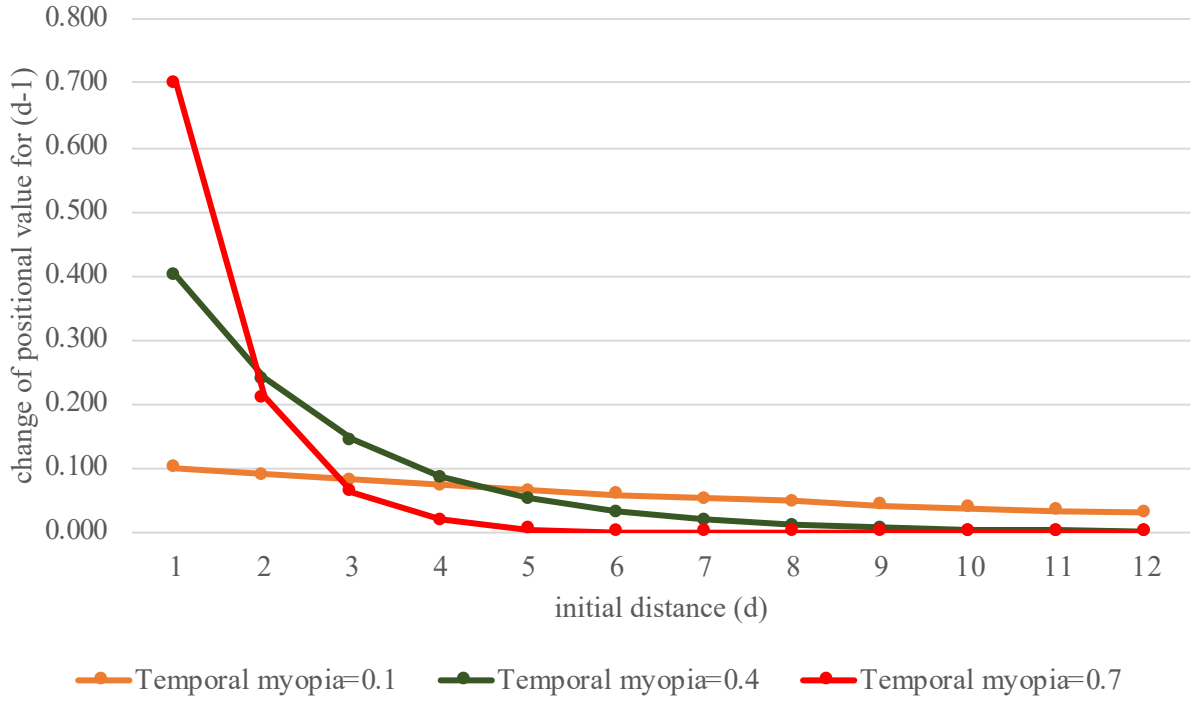
Longer horizons perform relatively poor across the board

Temporal myopia as temporal sensitivity mechanism (positional values)

Understanding “discounting”: absolute change and relative change

1. discounting directly influences relative value-change between decisions of different distance to goal

2. the more temporally myopic, ***the higher the relative value change*** and ***the lower the absolute attributed long-term value*** for a given decision.



Mechanism summary (relative vs absolute discount)

- Temporal myopia renders evaluation more sensitive to temporal distance changes
- Greater temporal myopia = greater sensitivity
- Relative value change is constant and higher for greater temporal myopia
- Attributed absolute change differs (constitutes a *positional value*)

➔ Big absolute value change differences depending on distance and temporal myopia

How does this mechanism play out over time?

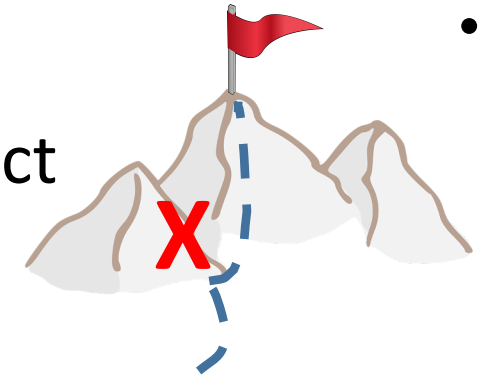
(Let's focus on horizon (λ =3) first)

We observe two important decision types for long-term goal implementation

- Stepping stone decisions

- Choice shortens distance to goal but lowers immediate performance

- Strategic reject decisions



- **Reject** choice that increases immediate performance but lengthens distance to goal

Both types forgo immediate performance

Either decision is taken when the attributed long-term position change is greater than immediate payoff change

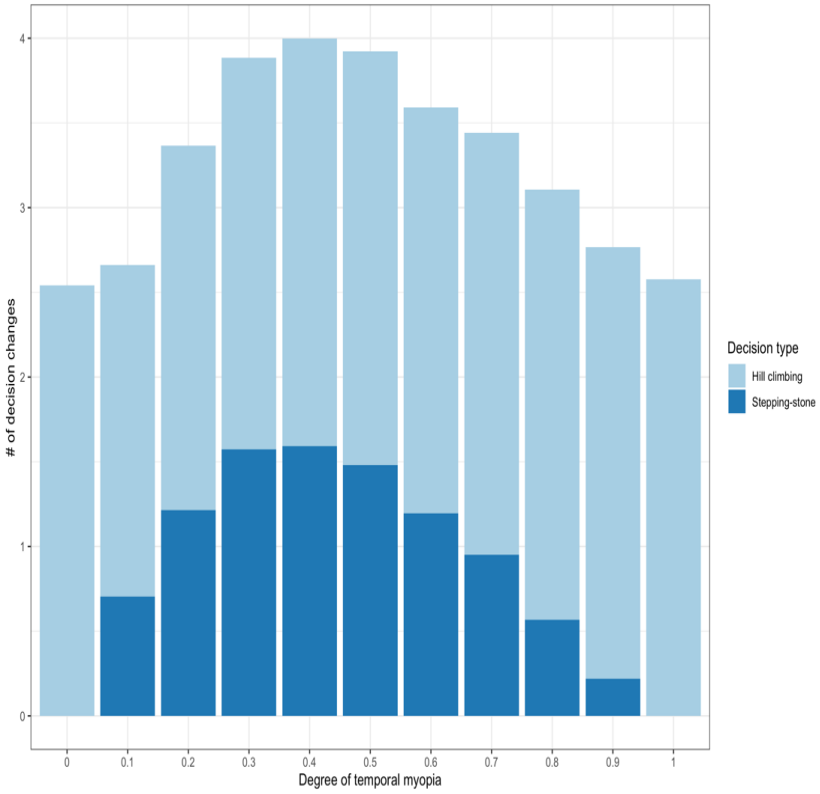
- Both types forgo immediate performance
- The firm will accept lower immediate performance if off-set by the gain in long-term positional value
- In formal terms, the max a firm will forgo in immediate performance is

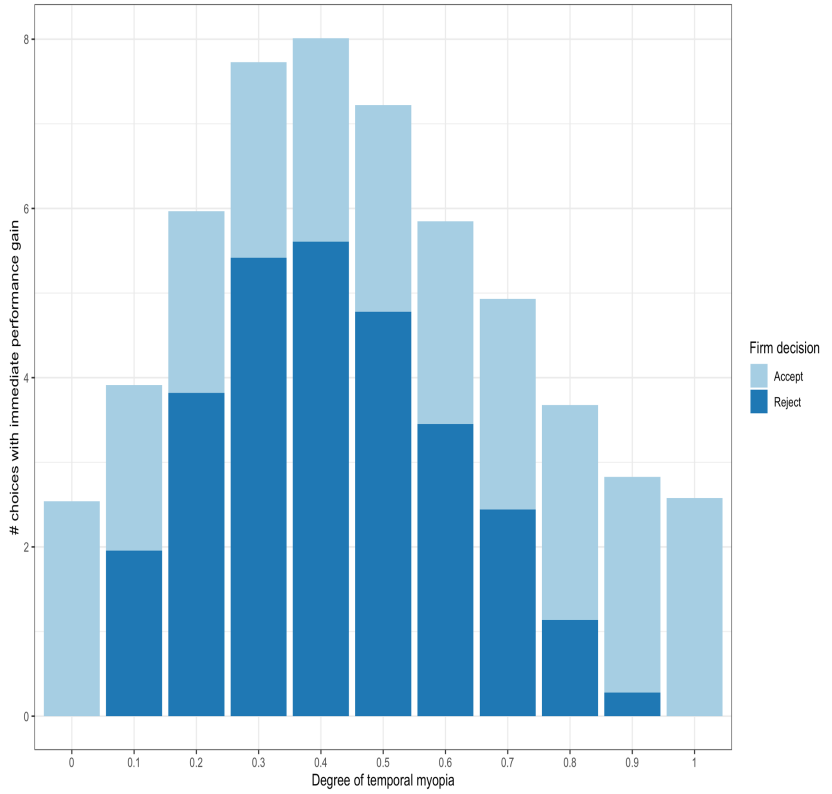
$$\delta_{max} = [(1-m)^{d-1} - (1-m)^{d}] * \Pi_l$$

Long-term goal performance

Discount change due to distance change

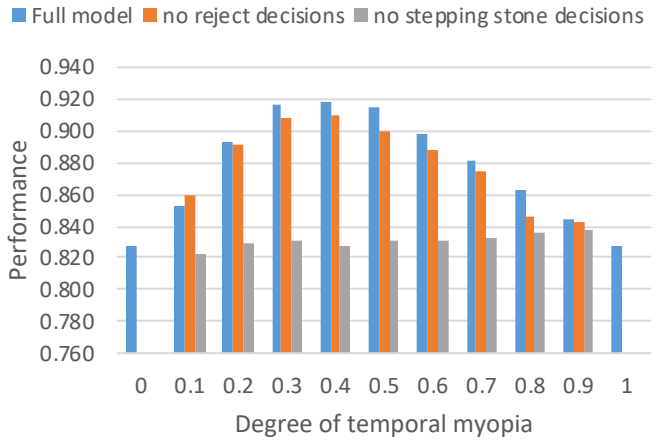
Temporal myopia influences how likely stepping stone and reject decisions are taken





Mechanism analysis (stepping/reject decisions)

- Counterfactual analysis (not allowing for stepping stone vs not allowing for strategic reject decisions)
- Strategic reject decisions can be (in part) substituted with additional stepping stone-decisions
- Stepping-stone decisions cannot be substituted
- However, strategic reject decisions are crucial for the "time to goal" (cuts time in half)

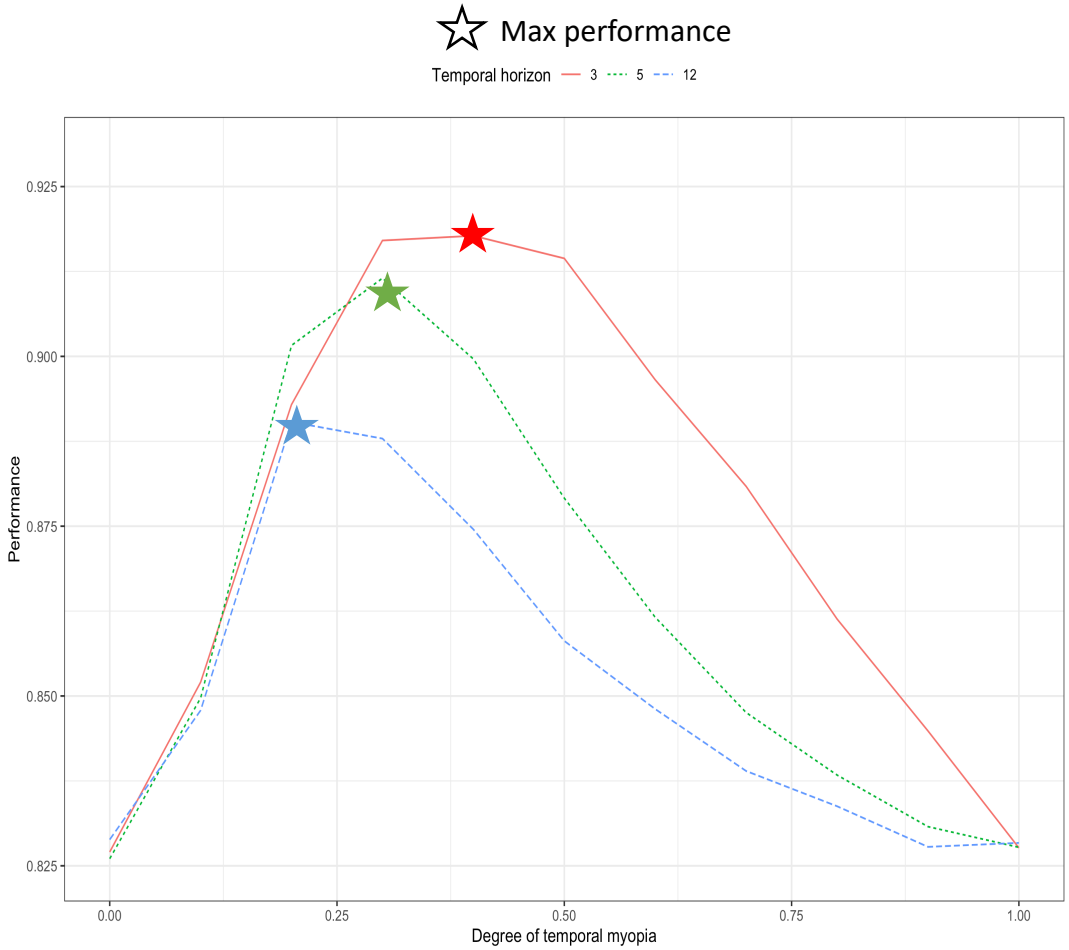


	Full model	No reject decisions	No stepping-stone decisions
Time to steady state	26.8	52.1	10.8
Performance	0.918	0.909	0.828
Long-term goal performance	0.951	0.948	0.939
Achieved long-term goal	0.61	0.51	0.17
Distance to long-term goal	1.1	1.40	2.2
# new long-term goals	1.5	4.4	0.8
# decision changes	4.0	12.6	1.5
# stepping-stone decisions	1.6	4.7	
Proportion of stepping-stone decisions	0.40	0.37	
Proportion of hill-climbing decisions	0.60	0.63	1.00
# rejected decisions	5.6		1.7

What is the role of temporal exploration horizon?

Mechanism analysis (horizon)

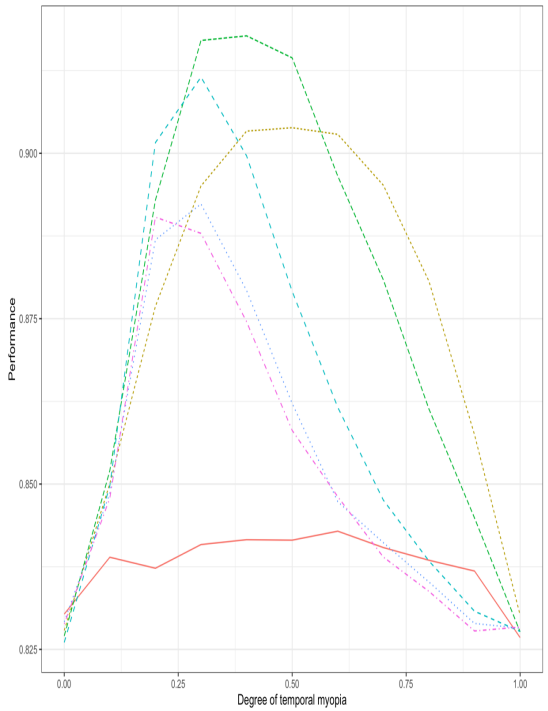
- The greater the horizon
- select greater long-term goals (extreme: when λ = N ==> always global peak)
- The more distant the goal
- High myopia: Absolute value changes between decisions small when so distant
- Lower myopia necessary to have some chance of stepping stone decisions



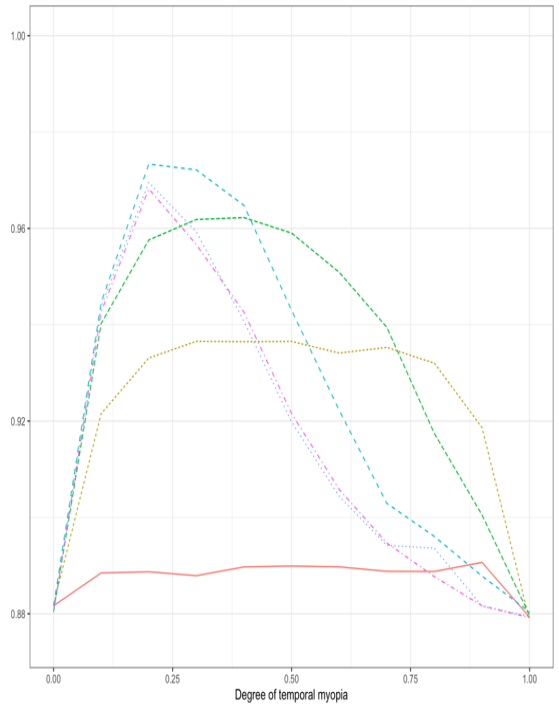
What is the role of task complexity?

Role of task complexity

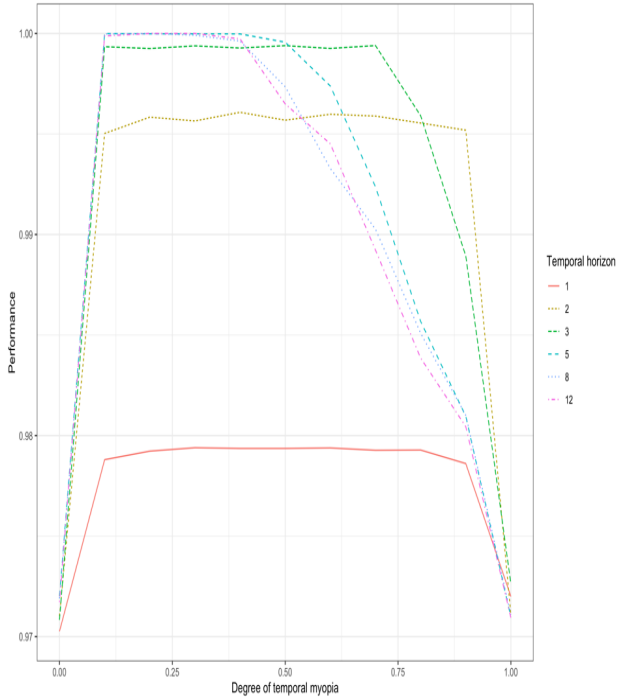
High complexity (K=11)



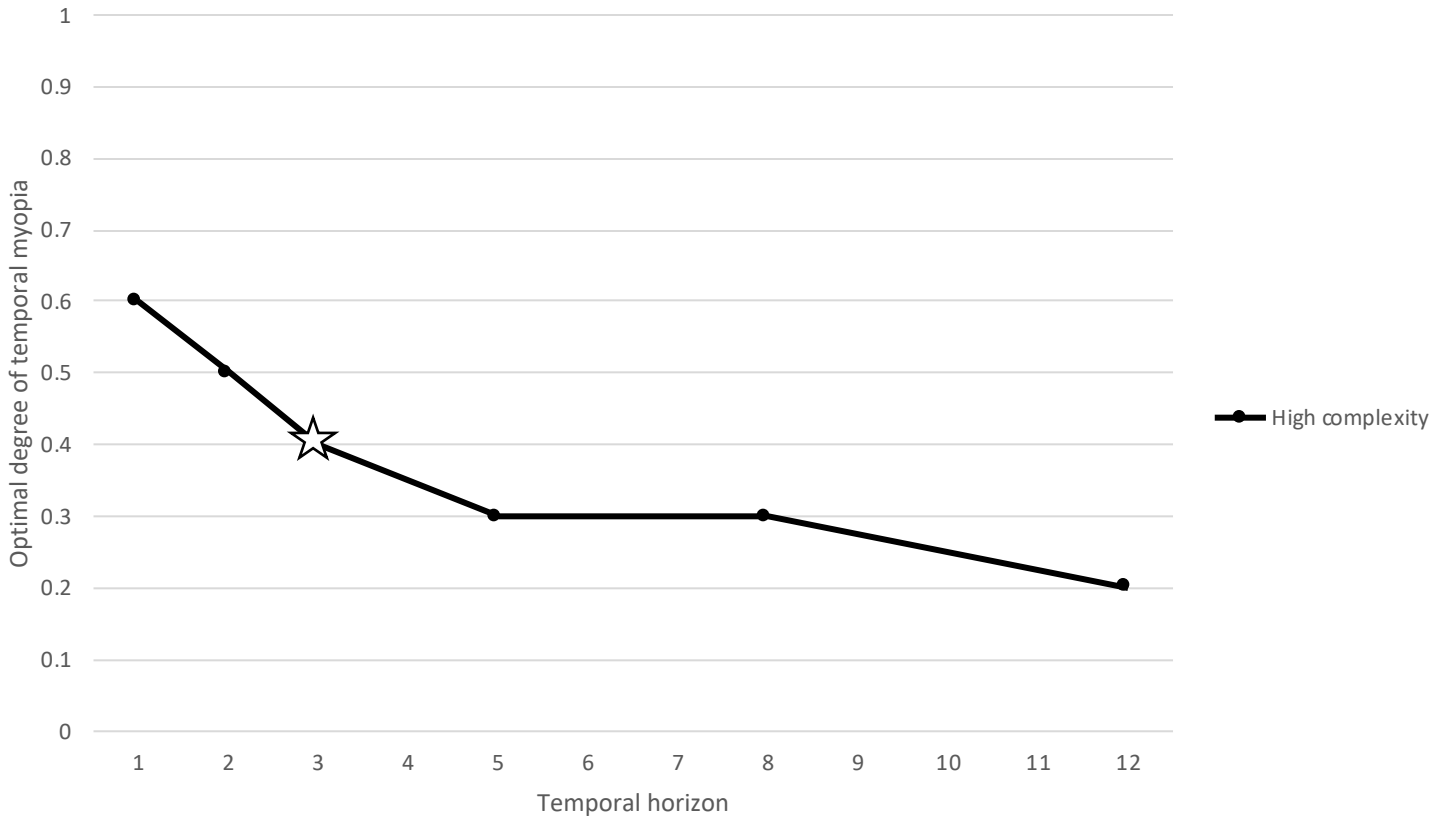
Medium complexity (K=6)



Low complexity (K=1)



Role of complexity: Optimal temporal myopia against horizon length



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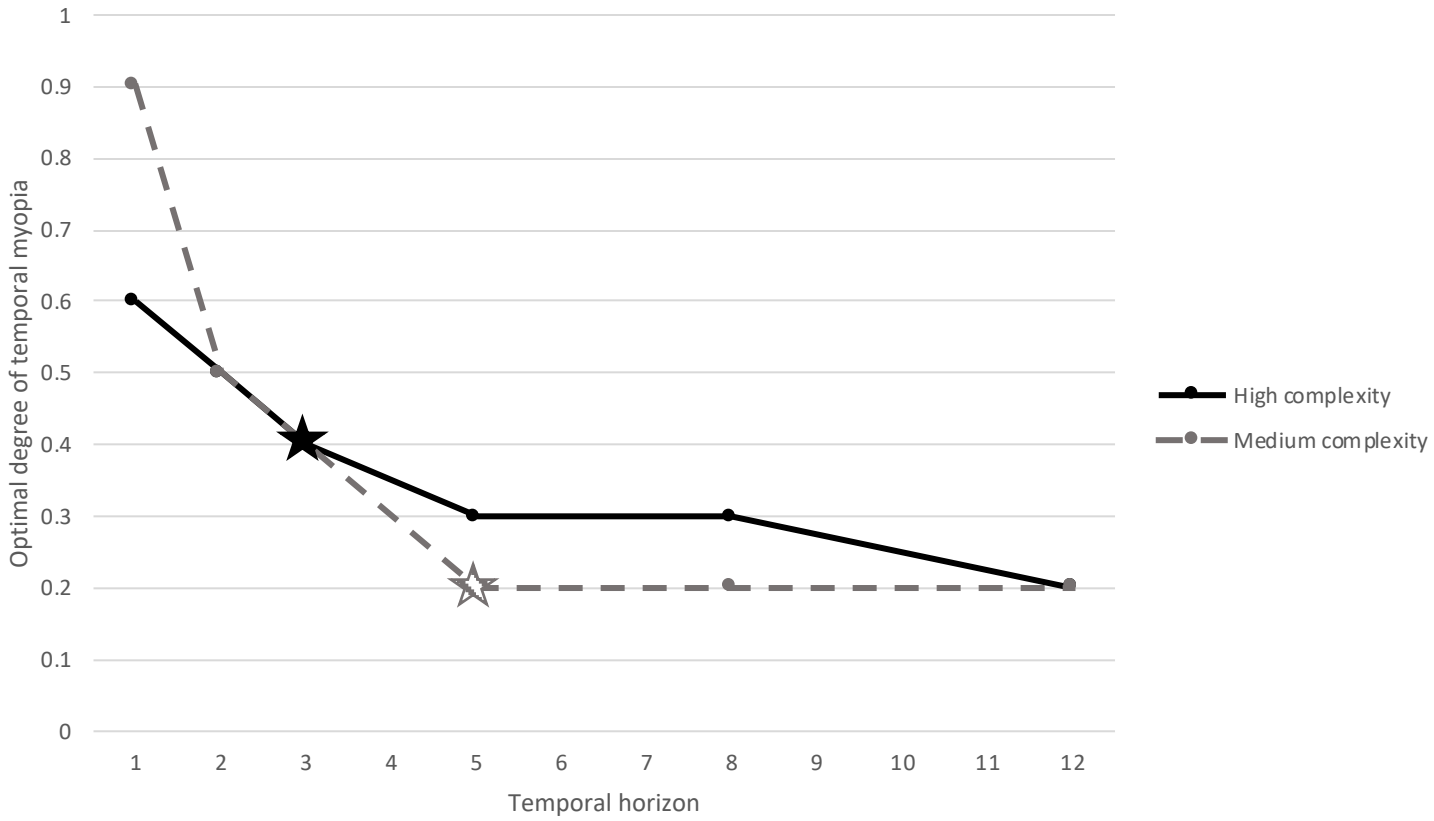

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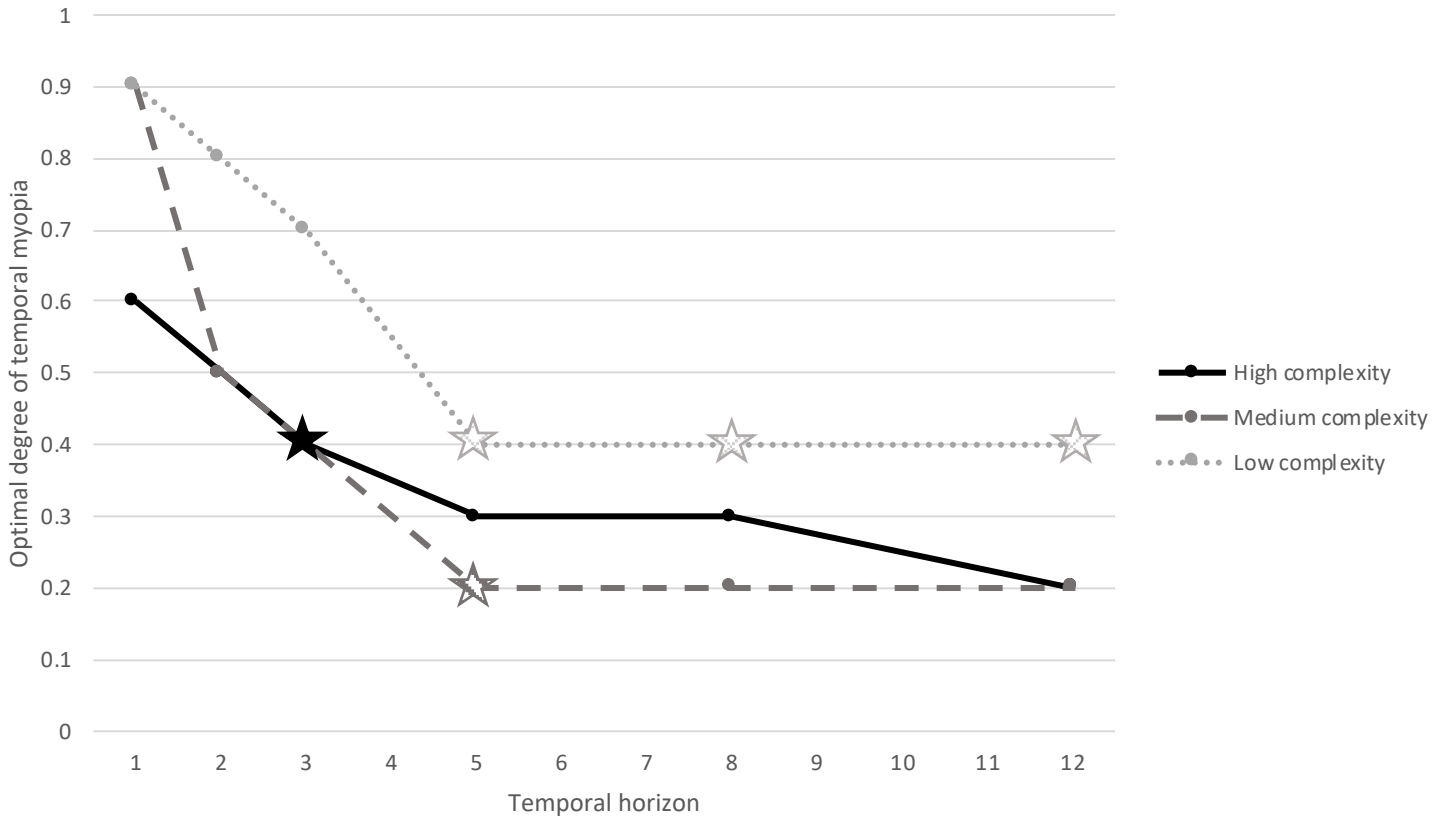
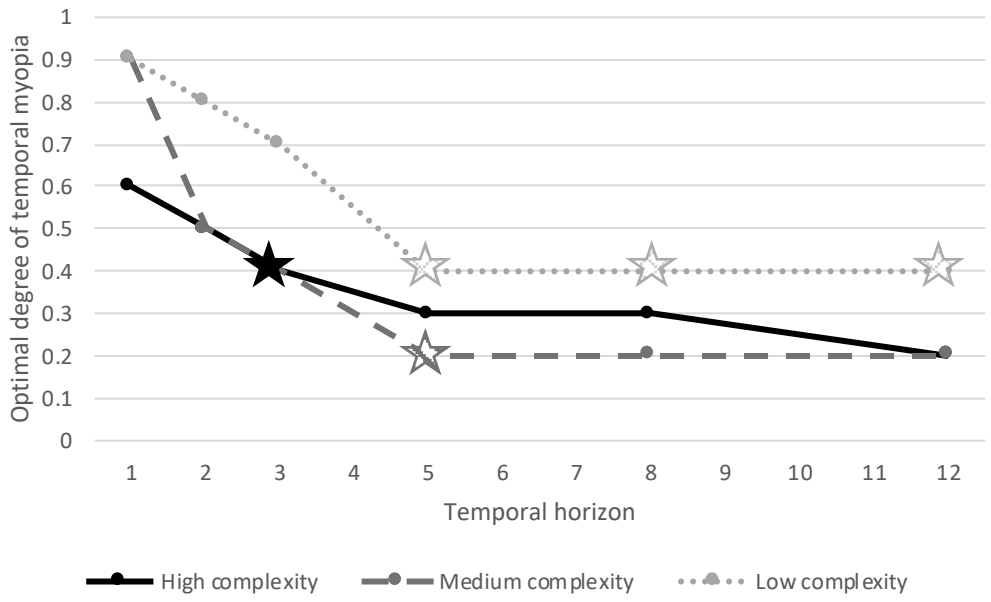


Role of complexity: Summary



- Greater complexity: optimal horizon shorter and temporal myopia higher
- With moderate complexity: optimal horizon longer and temporal myopia lower
- With low complexity: wide range and effect of horizon and myopia; less critical to high performance (i.e., firms may be fairly myopic and still achieve high performance)

Discussion

1. Temporal discounting as navigator (a new way of looking at discounting)
   - Temporal myopia (discounting) to distinguish between temporally spaced out decisions
   - Temporal myopia: curvilinear decision (rather than universally bad)

2. On long-term horizon and goal setting
   - Limits of exploring and setting distant (high performing goals)
   - In complex settings: moderately distant goals (update more frequently)

3. Matching discounting with temporal horizon
   - Prior literature focused on cost of capital (Jagganathan et. al 2016)
   - Separate literature on investment horizons (Souder et al. 2016)

4. The importance of choosing “what not to do”
   - Stepping-stone decisions (the obvious decisions to bridge valleys)
   - Strategic rejects: avoid lock-in at the expense of immediate profits
   - Reminiscent of Porter’s “choosing what not to do”

Future research/testable propositions

- P1: Greater discounting and long-term performance follow an inverted U-shaped effect
  - (some evidence provided in Finance: Jagganathan et al. 2016)

- P2: Industries with greater decision complexity have a greater proportion of short-term oriented firms survive over time
  - Relates to studies of planning and investment horizons (e.g., Souder et al. 2016, Souder & Bromiley 2012)

- P3: Firms that apply discount factors that matches the temporal horizon rather than the cost of capital, achieve greater long-term performance