

20 YEARS OF PRICE MOMENTUM

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COLUMBINE CAPITAL
SERVICES, INC.

CONTENTS

Building a price momentum model for stocks

Simple and complex alternatives

Comparisons

Price momentum in a realistic, multifactor setting

Sophisticated model offers potential for substantial portfolio return improvement

PRICE MOMENTUM FACTS

Short-term price change

Past 3 to 30 days

Price reverses (high turnover)

Intermediate-term price change

Past 3 to 12 months

Price persists (complicated)

Long-term price change

Past 2 to 5 years

Price reverses (mostly in Januarys)

COLUMBINE ALPHA

22-year published track record

Designed for institutional holding periods

Continual improvements

Exploit published research

Do our own research

Newest additions

Volume-change adjustment

Extreme price-change adjustment

MODEL COMPARISONS

Widely-used alternatives & Colombine Alpha variations

Comparison:

IC (Information Coefficient)

Compound return of 1st-10th decile spread

1st decile return and risk

Portfolio strategy results

- Multifactor process
- Realistic transactions costs

SIMPLE MODELS

Model 1	% Δ past month
Model 3	% Δ past 3 months
Model 6	% Δ past 6 months
Model 6-1	% Δ past 6 months minus % Δ past month
Model T	% Δ past 12 months
Model T-3	% Δ past 12 months plus % Δ past 3 months
Model T-1	% Δ past 11 months ending one month ago

COMPLEX MODELS

Model W

Sum of monthly % Δ over past year with proprietary weighting structure applied to monthly changes

Model B

Alpha obtained from a GLSQ weighted regression applied to the past year's monthly % Δ in stocks and market

Model CA

Model B adjusted for volume-changes and extreme price-changes

VOLUME CHANGE

Non-linear and complex

Short-term increases in volume

- Improve return of 1st decile price momentum stocks
- Effect is gone in three months

Long-term increases in volume

- Improve return of 1st quintile of price momentum by exclusion
- Effect persists out to thirty-six months
- Beneficial in 24 out of 30 years

EXTREME PRICE CHANGE

Extreme short-term reversal effect

Non-linear

Price change threshold and period are critical

Half of all occurrences during past 30 years
occurred in 1999 and 2000

Exclusion is beneficial in 24 out of 30 years

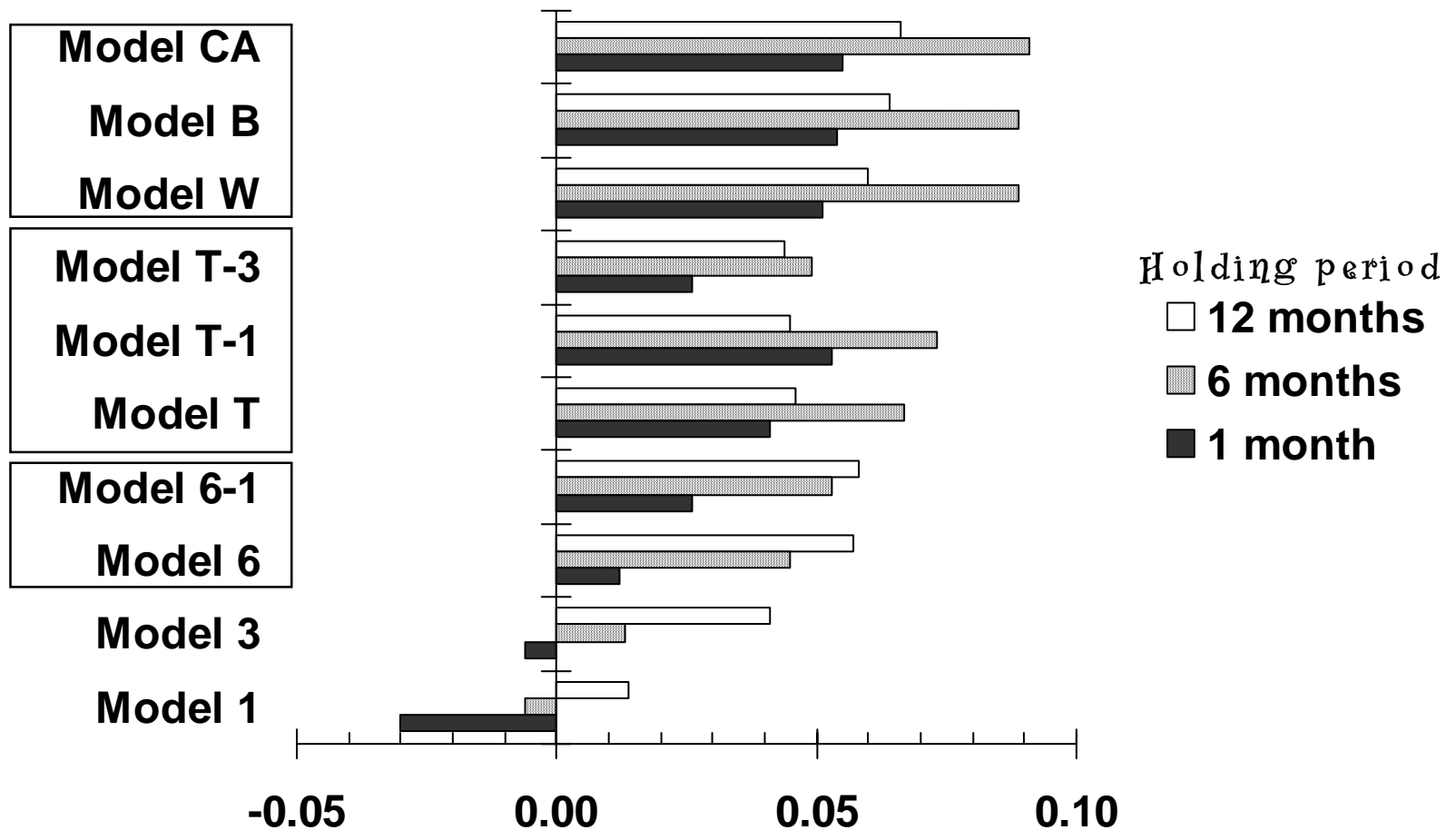
Combined with Volume Change

Adds +100 bps in 27 out of 30 years

Slight reduction in number of top-ranked stocks

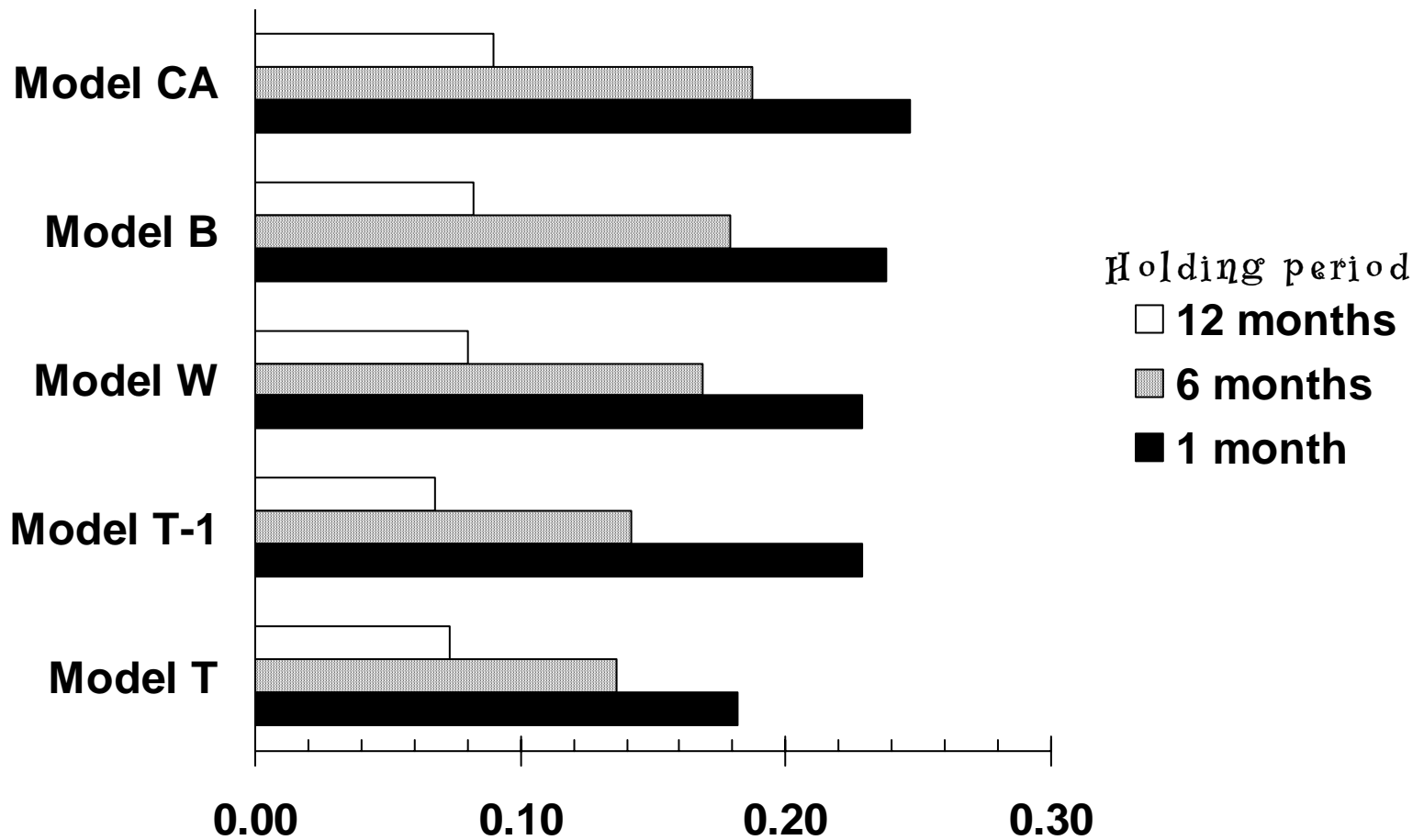
Too volatile for use at bottom

INFORMATION COEFFICIENTS

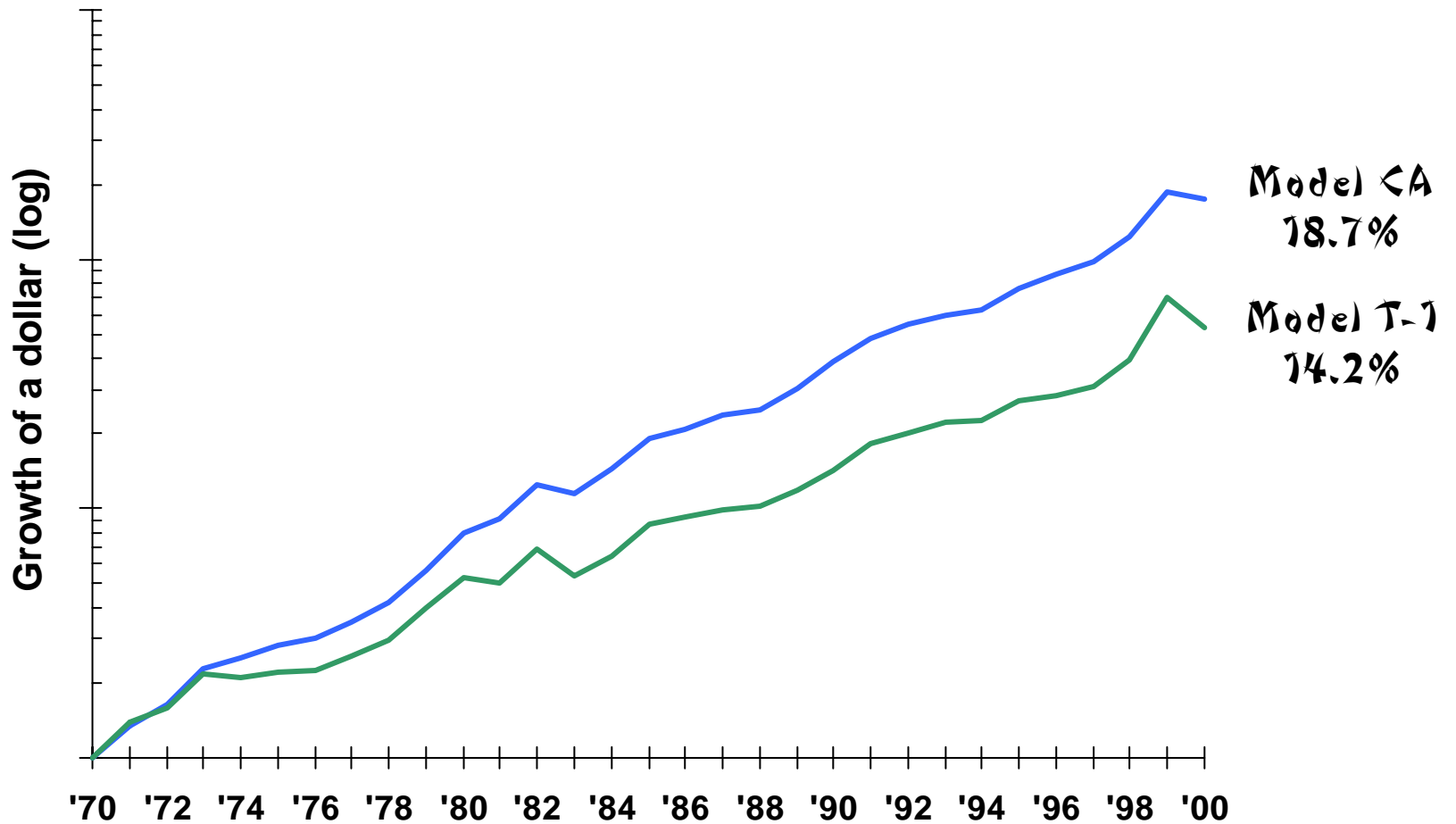


COMPETITIVE MODELS

Compound 1st-10th decile spread



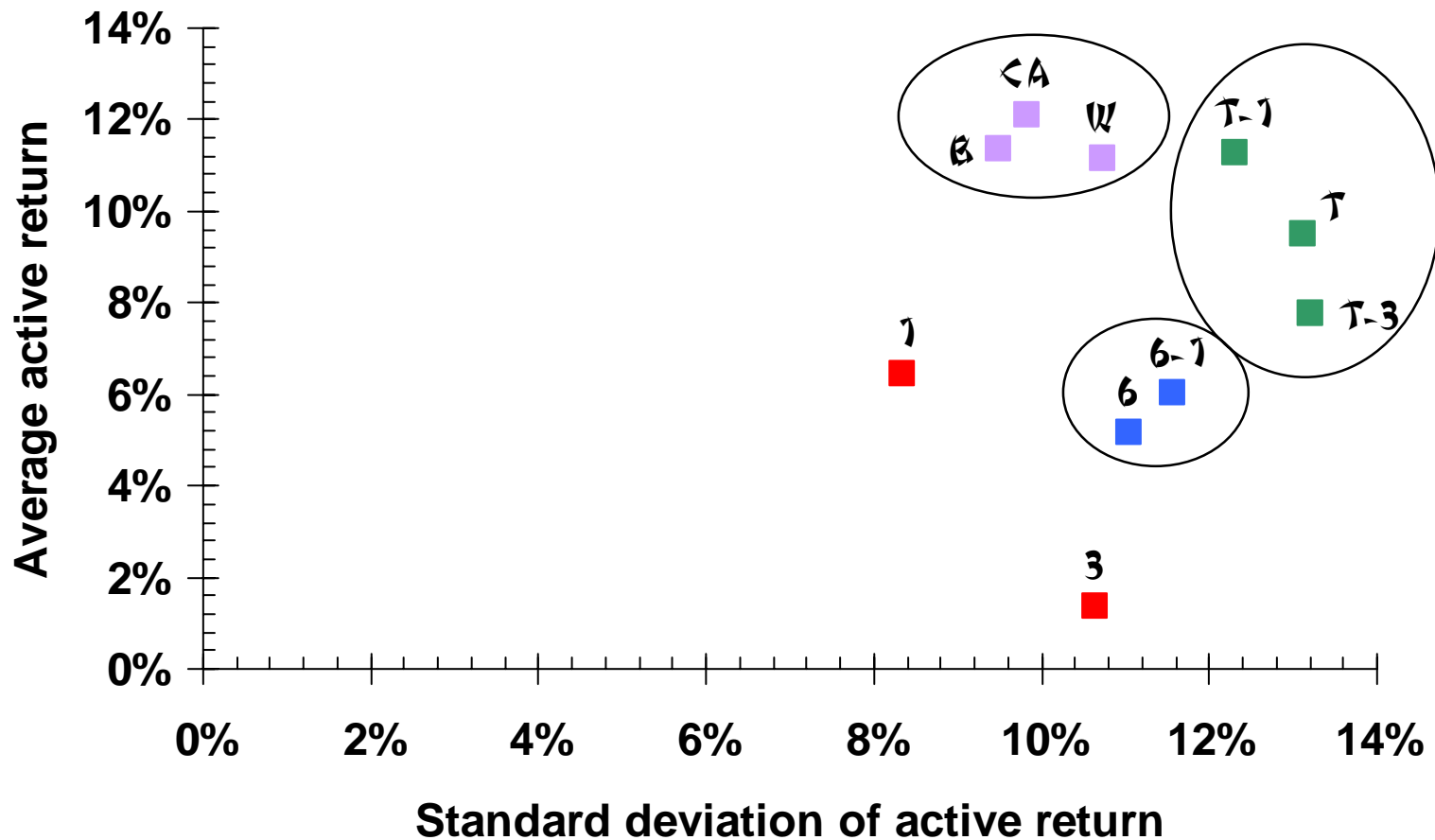
CUMULATIVE COMPOUND RETURN



Test Universe: *Columbine 1500 Universe*, 1st-10th decile spread, 6-month holding, no costs

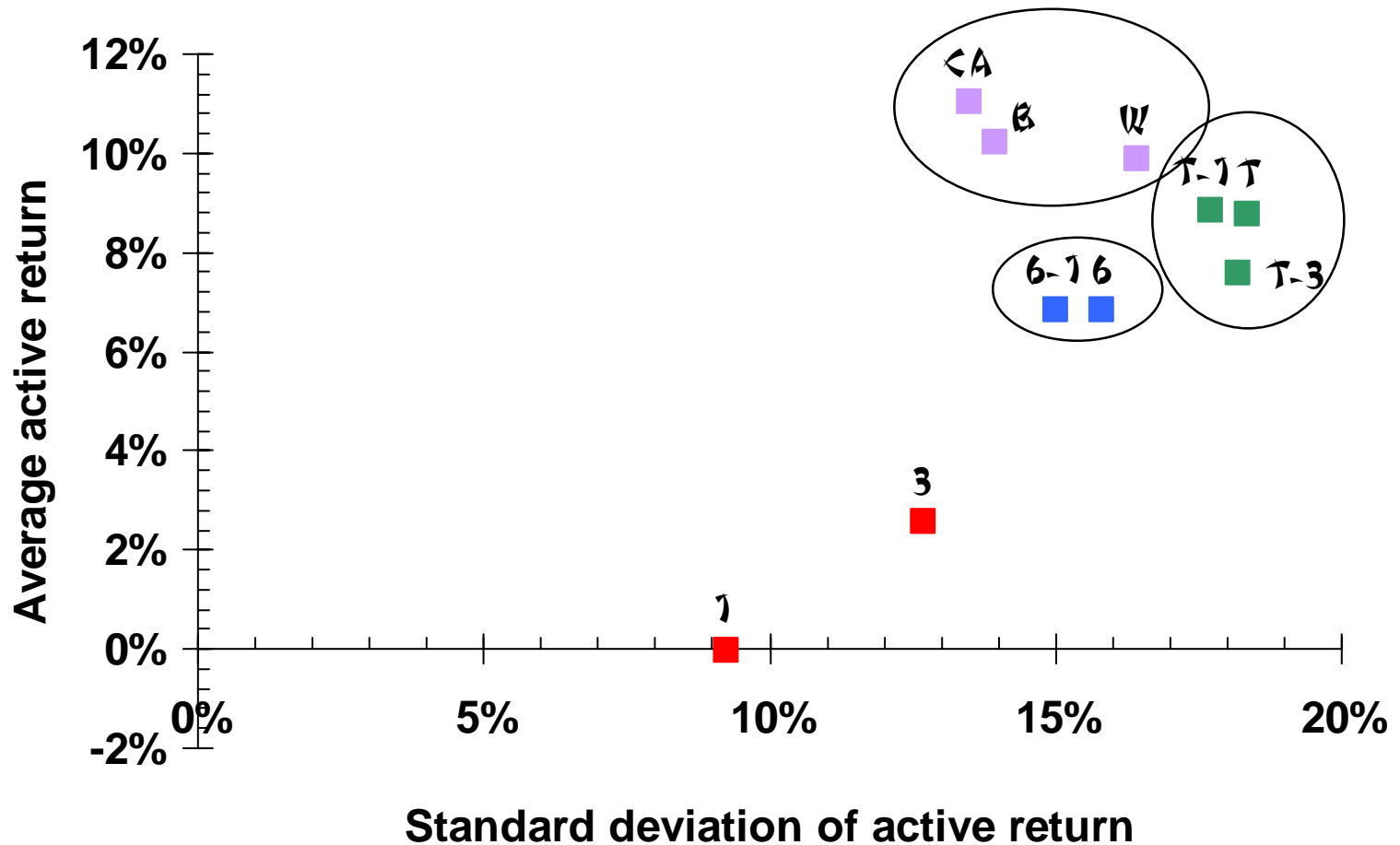
RETURN & RISK:

One-month holding period



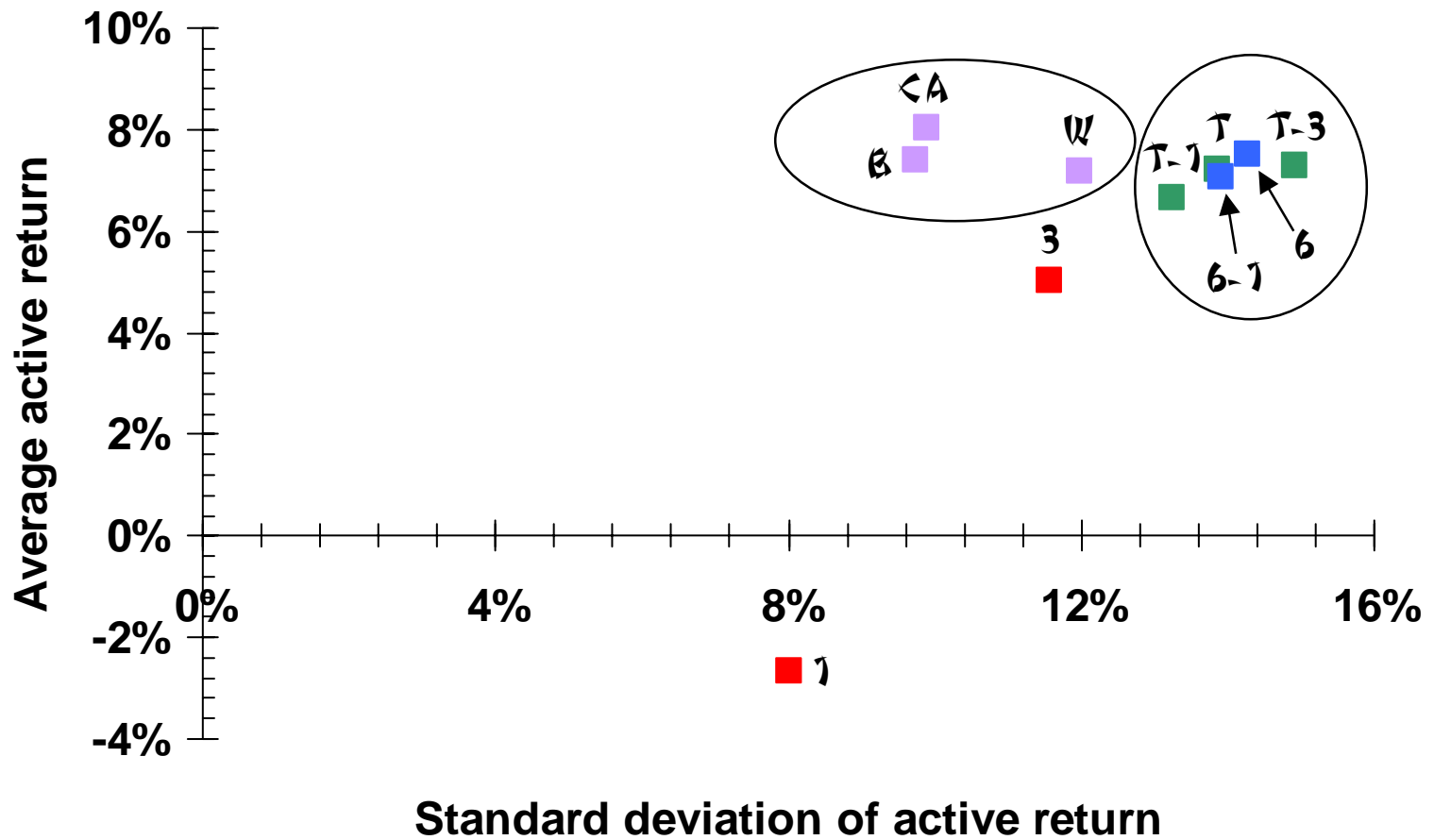
RETURN & RISK:

Six-month holding period



RETURN & RISK:

Twelve-month holding period



IMPROVEMENT CONTRIBUTIONS

Structural relative strength

Dodge "January effect"

Exploit short-term reversal

Optimal weighting structure

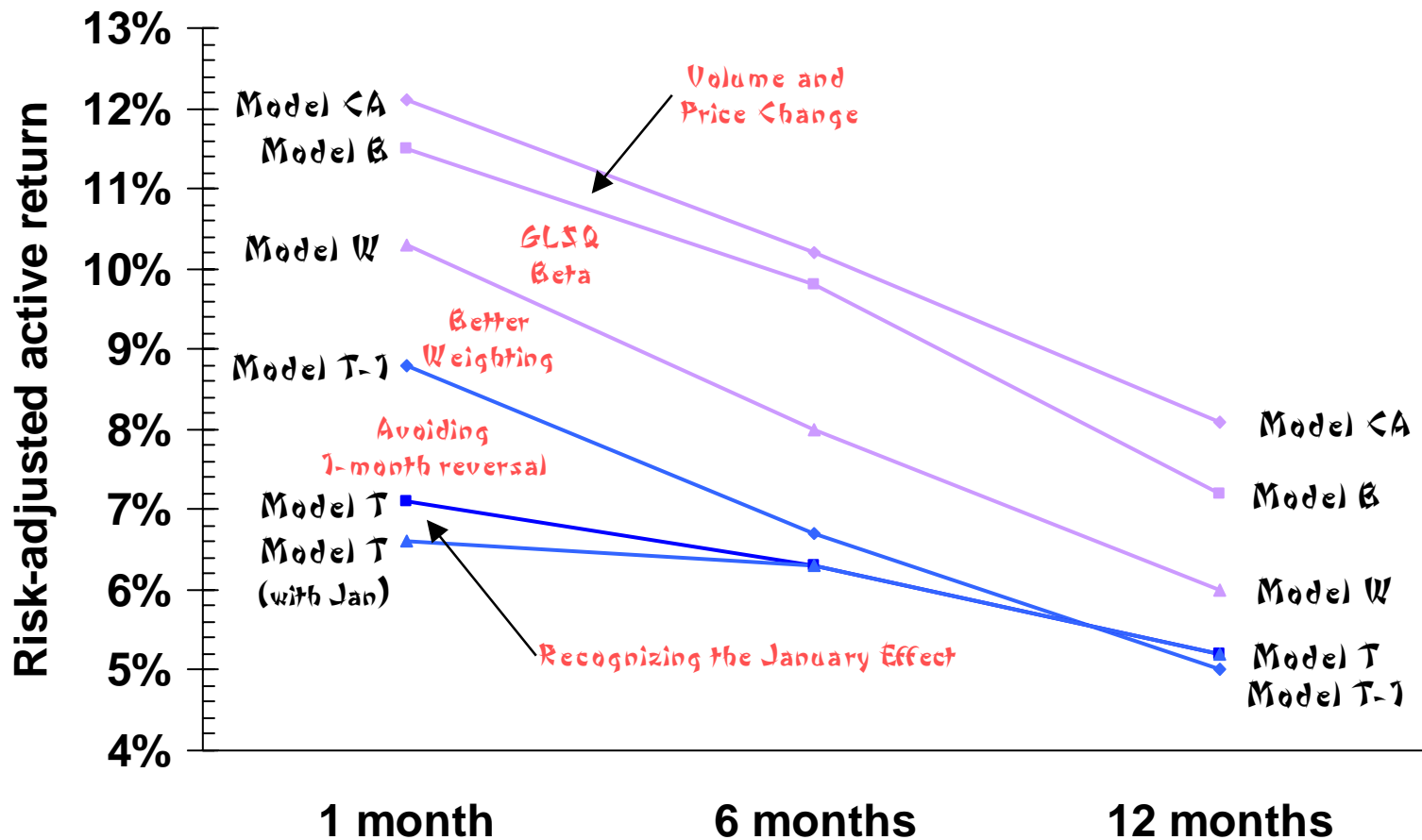
Adjustments

Market effects (beta)

Long-term volume change

Extreme price changes

HOW MUCH IMPROVEMENT?



PORTFOLIO STRATEGIES

Competitive price momentum and fundamental factors

Similar ICs

Better returns

Fluctuates with momentum factors, opposite to value factors

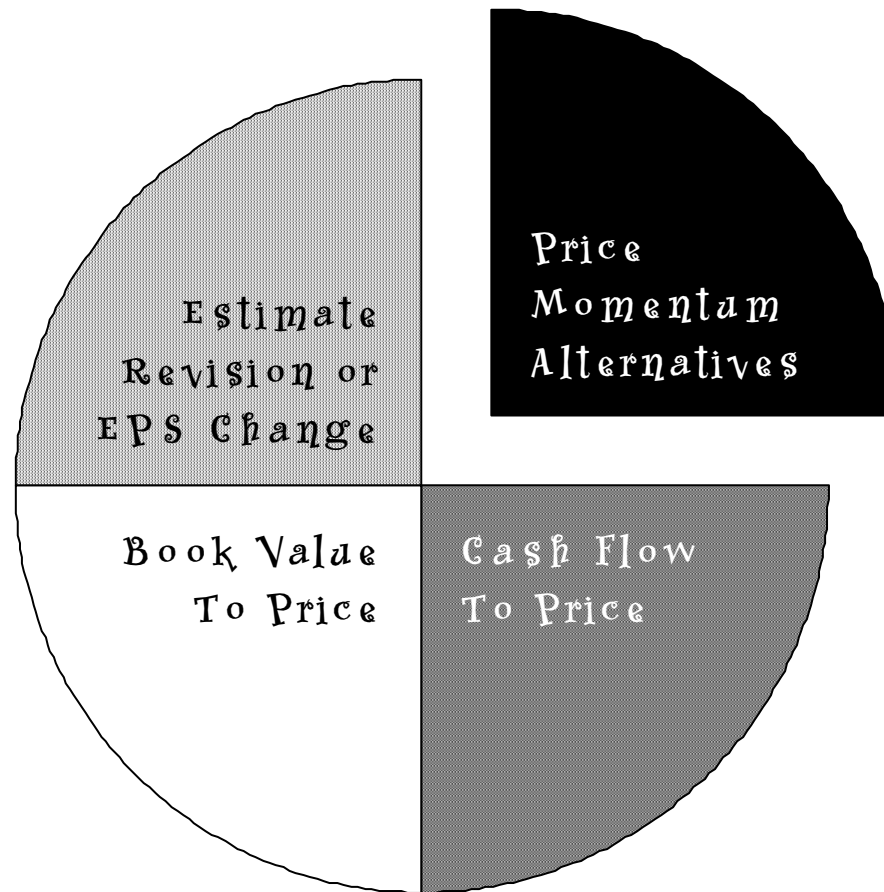
Simple 4-factor test model

Realistic transactions costs (2.5%)

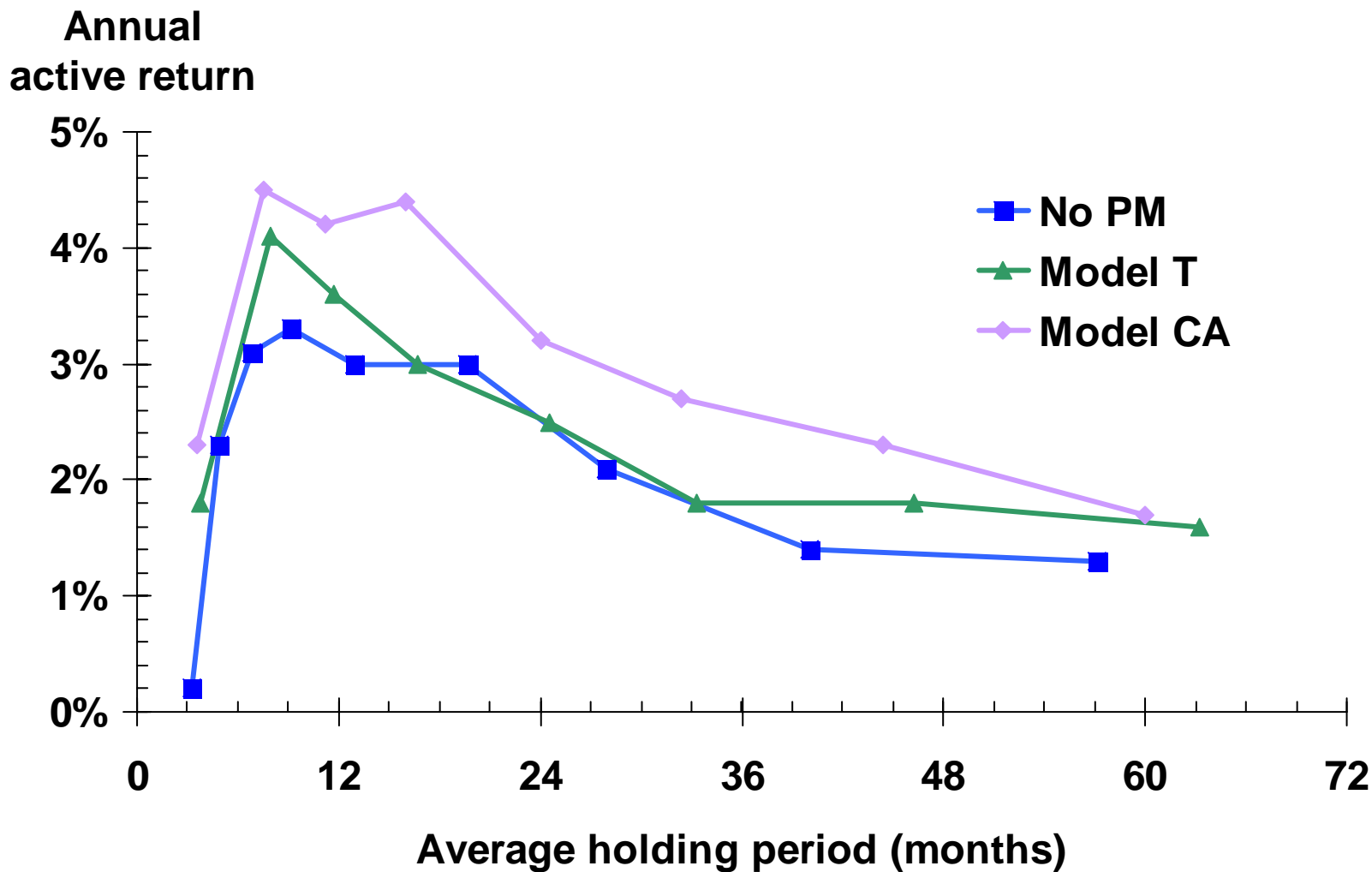
Realistic universe

Sector-neutral risk control

SIMPLE FOUR-FACTOR MODEL



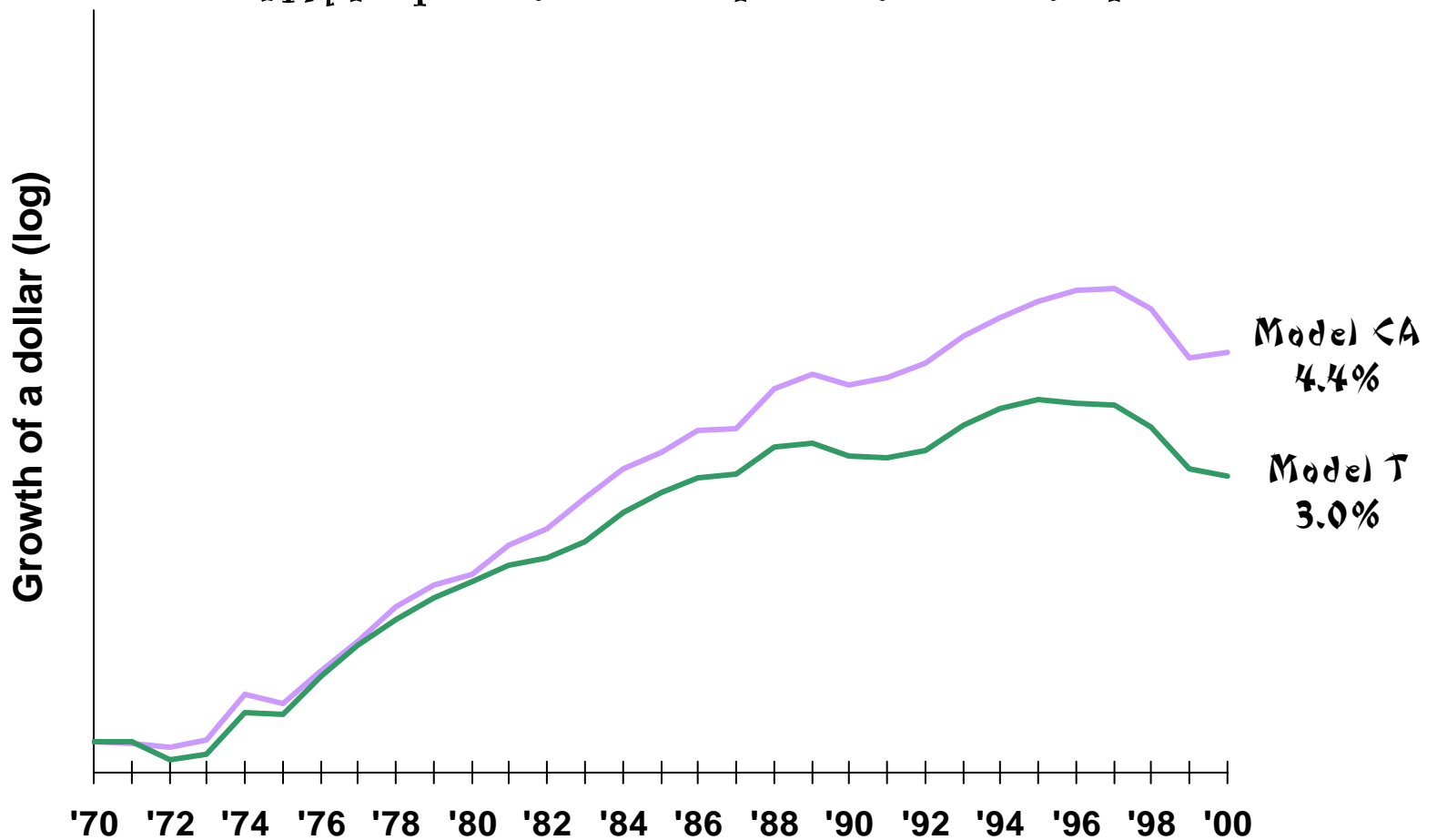
STRATEGY COMPARISON



Test universe: *Columbine 1500 Universe*—test period: 1971-2000
 Sector-neutral portfolio, monthly rebalancing, 2.5% round-trip costs

CUMULATIVE ACTIVE RETURN

Simple 4-Factor Model - Sector Neutral



MULTIFACTOR RESULTS

Columbine Alpha adds more return, particularly
>12-month holding periods

Simple models add little at >12-month holding
periods

Time pattern of results shows steady gain

Expected and actual advantages: 100 basis
points to active bottom line



CONCLUSIONS

Price momentum is not a generic ingredient

Volume and extreme price change adjustments
add value

Model CA beats best simple alternatives by
300+ bps at all holding periods

Model CA adds 100+ bps in realistic portfolio
strategies