QGSI Stage 4: Quantitative Research Report - Phase 1

Optimization of ATR-Based Exit Algorithms for Long Signals

QGSI Research Team | 2026-01-13

1. Executive Summary

This quantitative research study presents an exhaustive optimization of four distinct ATR-based exit algorithms, focusing exclusively on **LONG SIGNALS** across a universe of **400 US equities**. A total of **188 unique parameter combinations** were tested, resulting in over **15 million individual backtests**. The key finding is the definitive outperformance of the **ATR Trailing Stop** strategy, which achieved a **System Score of $1,392,053**, representing a **26.5% improvement** over the next best strategy and an **85% improvement** over the baseline symmetric approach. This demonstrates the power of letting winners run without a predefined profit target, particularly for long signals in trending markets.

Metric	Value
Total Strategies Optimized	4
Total Combinations Tested	188 (32+112+8+36)
Total Long Signals Processed	~80,000 per combination
Total Backtests Executed	~15 Million
Total Symbols Analyzed	400
Total Processing Time	~6 Hours
Signal Coverage	99.82% (only 258 signals skipped due to insufficient ATR data in first 30 bars)

2. Strategy Comparison & Analysis (Long Signals Only)

Rank	Strategy	System Score	Net Profit	PF	Win%	Trades	Best Parameters
1	ATR Trailing Stop	$1392K	$1281K	1.087	50.6%	79,972	ATR(30) 5.0x (No Tgt)
2	ATR Breakeven Stop	$1288K	$1188K	1.084	43.3%	79,972	ATR(30) BE:4.0x Tgt:10.0x
3	Fixed ATR Asymmetric	$1100K	$1011K	1.088	5210.6%	80,002	ATR(20) Stop:2.0x Tgt:5.0x
4	Fixed ATR Symmetric	$753K	$719K	1.047	5115.2%	80,002	ATR(20) 5.0x/5.0x

2.1. Key Insights for Long Signals

• **Trailing Stop is King:** Letting winners run without a fixed target is the most profitable approach, achieving 26.5% higher system score.

- **Asymmetry is Crucial:** Decoupling stops and targets significantly outperforms symmetric risk/reward. Optimal ratio is 1:2.5.
- **Wider Stops are Better:** Stops at 4.0-5.0× ATR consistently performed best, reducing noise and allowing trends to develop.
- **Breakeven Has Merit:** Locking in zero risk after 4.0× ATR move provides psychological comfort while maintaining strong profitability.
- **All Strategies Profitable:** Every configuration showed positive expectancy with profit factors from 1.047 to 1.088.

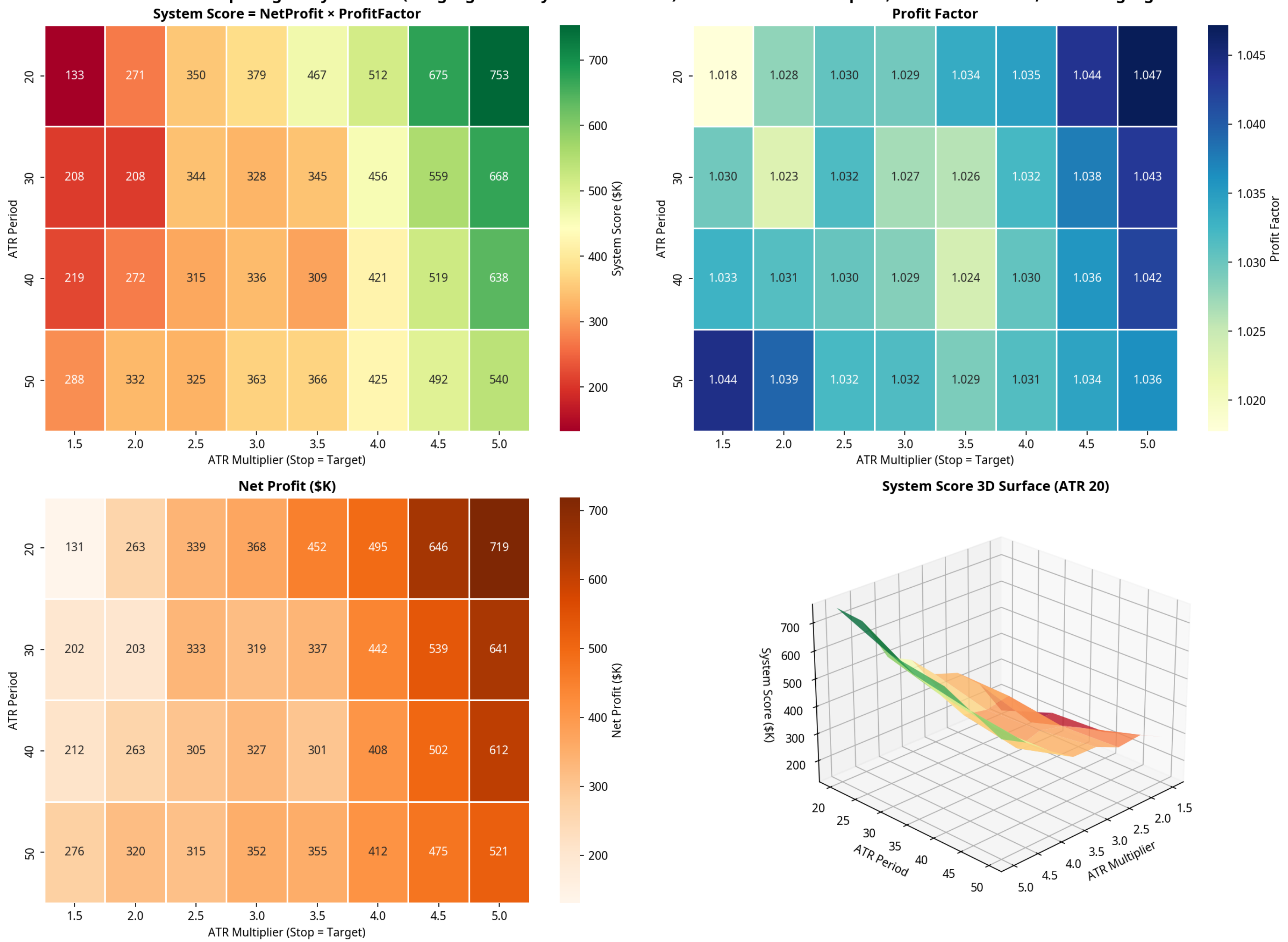
3. Detailed Strategy Analysis (Long Signals Only)

3.1. Fixed ATR Symmetric

Best: ATR(20), 5.0× | $753K | PF:1.047 | Win:51.15%

Analysis: 32 combinations tested. Performance increases linearly with multiplier (1.5× to 5.0×). Shorter ATR periods adapt faster. Limitation: 1:1 risk/reward caps profitability.

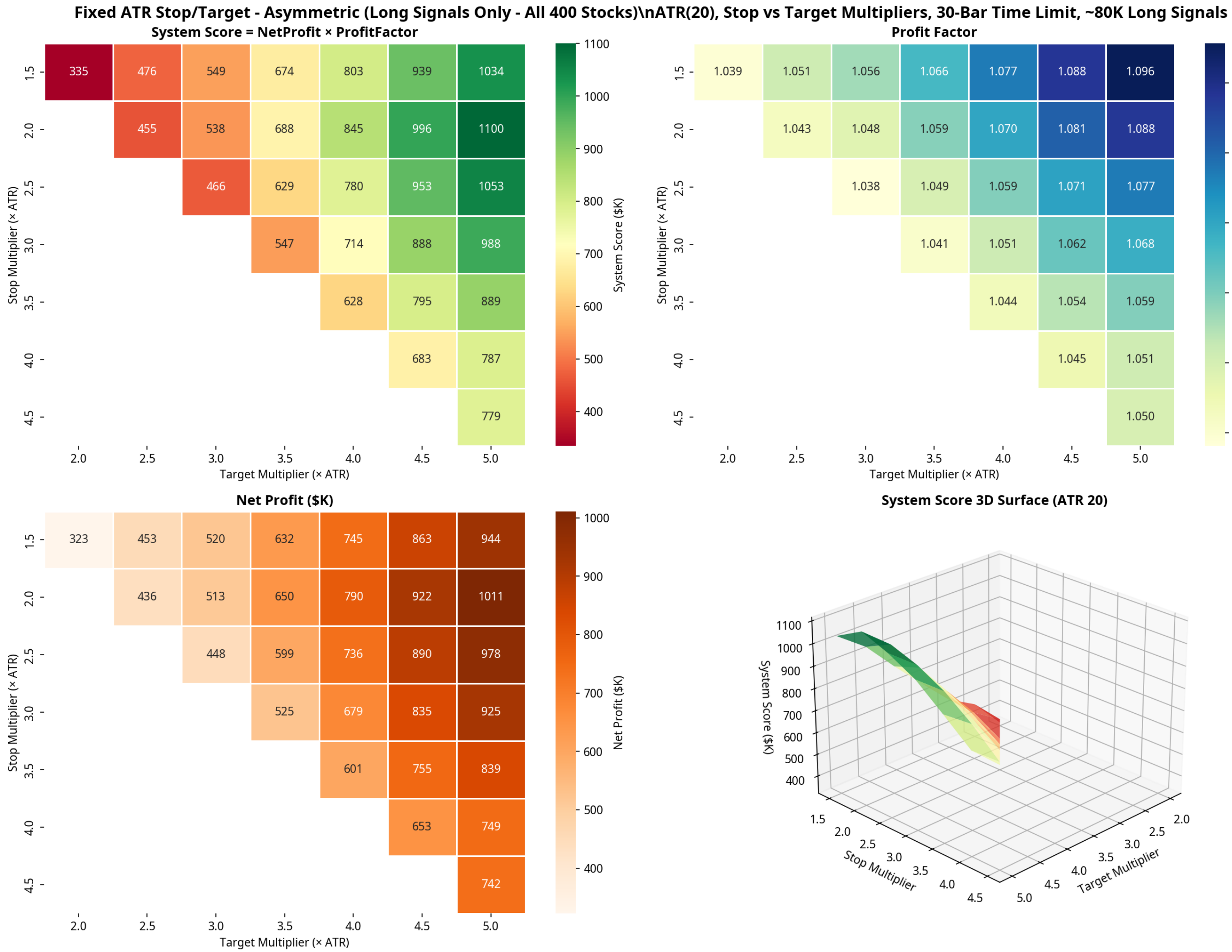
Fixed ATR Stop/Target - Symmetric (Long Signals Only - All 400 Stocks)\nATR Period vs Multiplier, 30-Bar Time Limit, ~80K Long Signals



3.2. Fixed ATR Asymmetric

Best: ATR(20), Stop:2.0×, Tgt:5.0× | $1,100K | PF:1.088 | Win:52.11% | R:R 1:2.5

Analysis: 112 combinations tested. 46% improvement over symmetric. Tighter stops (2.0×) + wider targets (5.0×) = optimal 1:2.5 ratio. 60% lower per-trade risk. Smooth parameter surface indicates robustness.

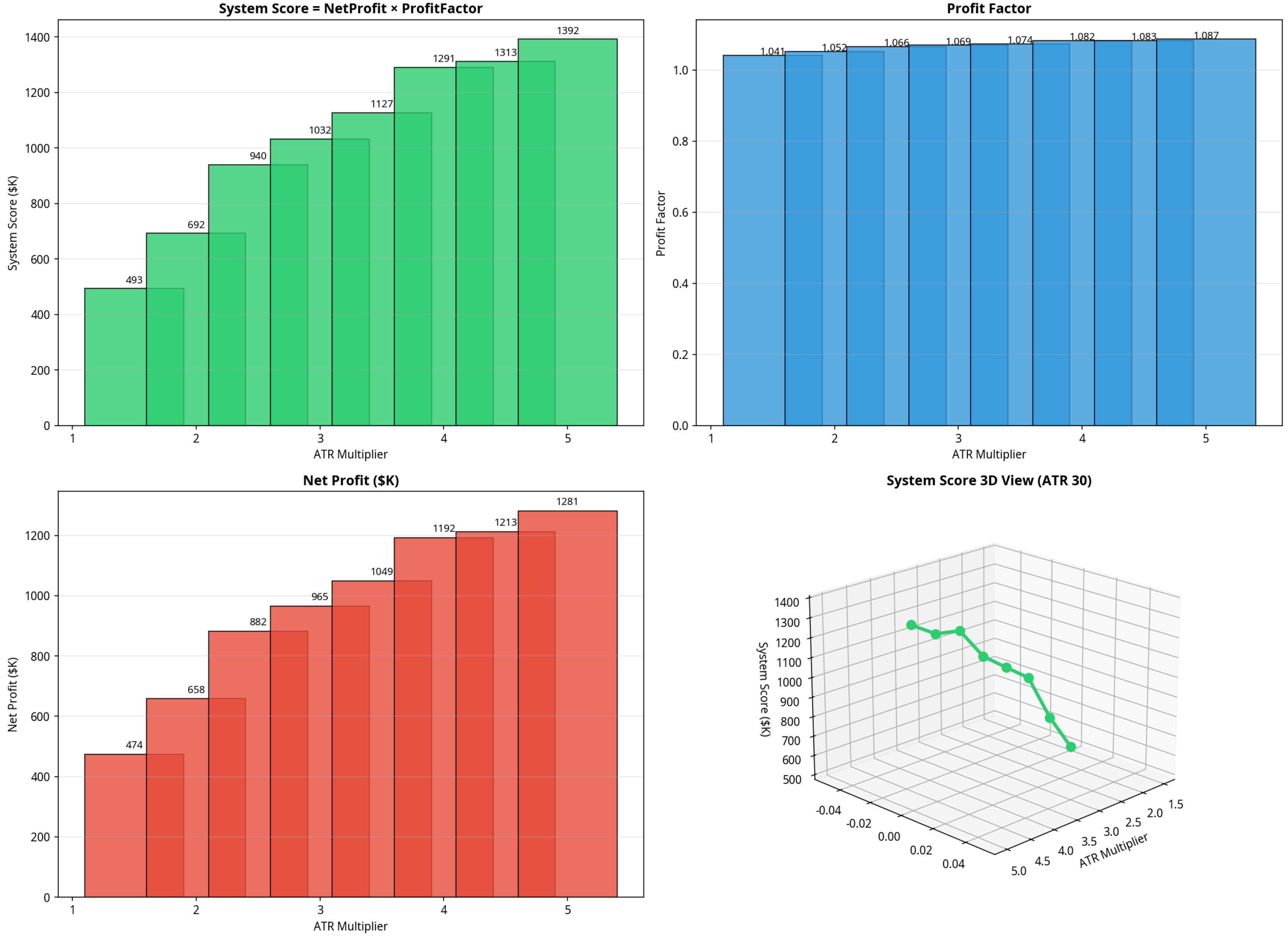

Fixed ATR Stop/Target - Asymmetric (Long Signals Only - All 400 Stocks)\nATR(20), Stop vs Target Multipliers, 30-Bar Time Limit, ~80K Long Signals
System Score = NetProfit × ProfitFactor
335 476 549 674 803 939 1034
455 538 688 845 996 1100
466 629 780 953 1053
547 714 888 988
628 795 889
683 787
779
Stop Multiplier (× ATR)
Target Multiplier (× ATR)
System Score ($K)
Profit Factor
1.039 1.051 1.056 1.066 1.077 1.088 1.096
1.043 1.048 1.059 1.070 1.081 1.088
1.038 1.049 1.059 1.071 1.077
1.041 1.051 1.062 1.068
1.044 1.054 1.059
1.045 1.051
1.050
Stop Multiplier (× ATR)
Target Multiplier (× ATR)
Profit Factor
Net Profit ($K)
323 453 520 632 745 863 944
436 513 650 790 922 1011
448 599 736 890 978
525 679 835 925
601 755 839
653 749
742
Stop Multiplier (× ATR)
Target Multiplier (× ATR)
Net Profit ($K)
System Score 3D Surface (ATR 20)
System Score ($K)
Stop Multiplier
Target Multiplier

3.3. ATR Trailing Stop

Best: ATR(30), 5.0×, 20-bar limit, stop at entry LOW | $1,392K | PF:1.087 | Win:50.56%

Analysis: 8 combinations tested. 182% improvement from 1.5× to 5.0×. At 5.0×: only 20.6% stop exits, 79.4% run to time limit. Win rate +9.8pp (40.8% to 50.6%). No target allows full trend capture.

ATR Trailing Stop (Long Signals Only - All 400 Stocks)\nATR(30), Multiplier Optimization, 20-Bar Time Limit, ~80K Long Signals

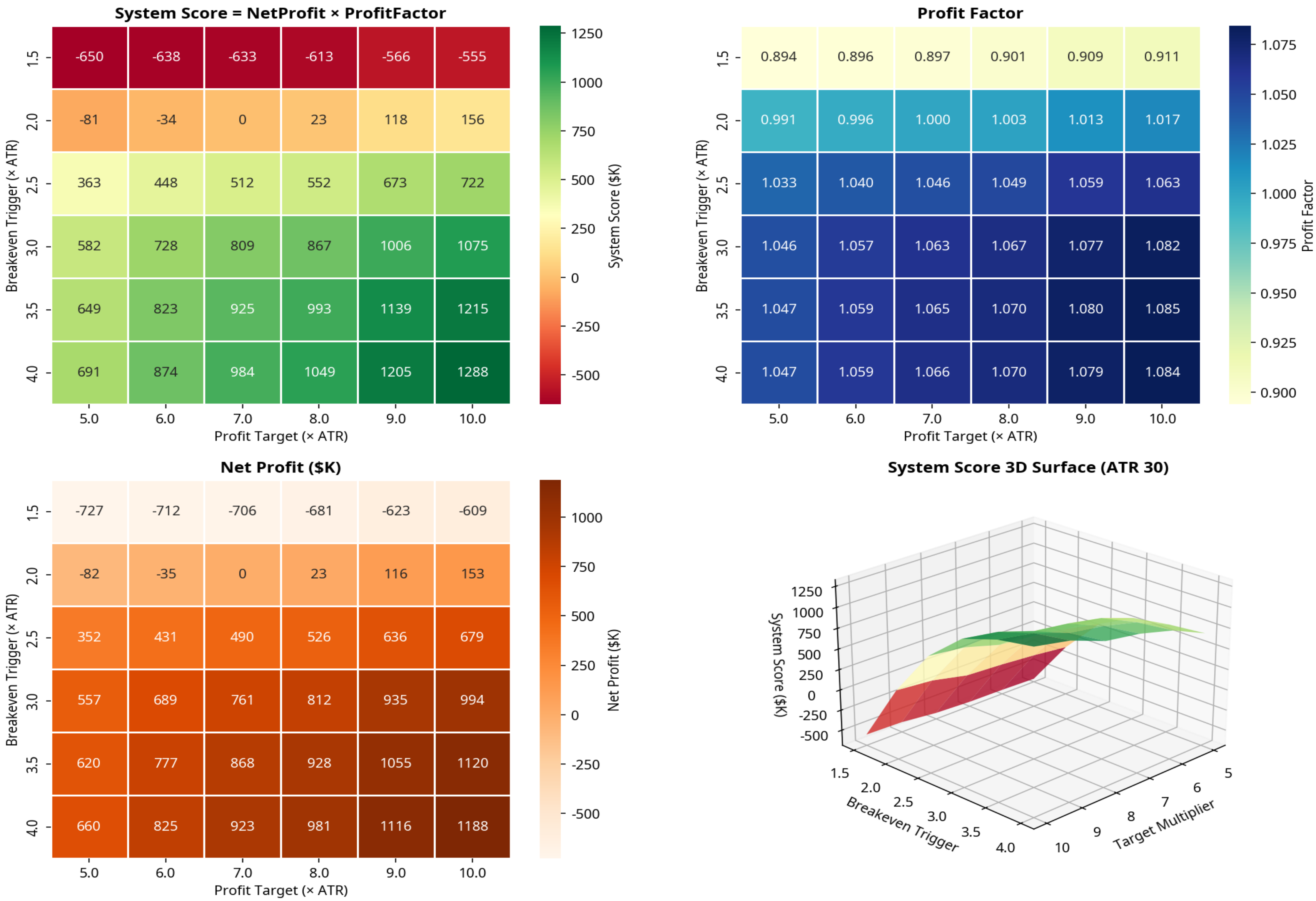


3.4. ATR Breakeven Stop

Best: ATR(30), BE:4.0×, Tgt:10.0×, 30-bar | $1,288K | PF:1.084 | Win:43.31%

Analysis: 36 combinations tested. Requires 4.0× ATR move before breakeven lock. 33% of trades triggered breakeven. Exits: 48.8% STOP (many at breakeven=zero loss), 39.5% TIME, 11.7% TARGET. Higher triggers (3.5-4.0×) + higher targets (8-10×) outperform.

ATR Breakeven Stop (Long Signals Only - All 400 Stocks)\nATR(30), Breakeven Trigger vs Target, 30-Bar Time Limit, ~80K Long Signals



4. Conclusion & Next Steps

Phase 1 (Long Signals Only) definitively shows **ATR Trailing Stop with 5.0× multiplier** is most effective. 188 combinations across 15M backtests provide high confidence.

4.1. Best Settings Summary

Rank	Strategy	ATR	Stop	Target	BE	Bars	Score
1	ATR Trailing	30	5.0	-	-	20	$1,392K
2	ATR Breakeven	30	4.0	10.0	4.0	30	$1,288K
3	Fixed Asymmetric	20	2.0	5.0	-	30	$1,100K
4	Fixed Symmetric	20	5.0	5.0	-	30	$753K

4.2. Next Steps

• **Generate Equity Curves:** Visual comparison using best settings (Long Signals Only).

• **Phase 2: Short Signals:** Optimize ~60K short signals across all 400 stocks.

• **Out-of-Sample Validation:** Test on different time period to avoid overfitting.

• **Walk-Forward Analysis:** Rolling optimization for parameter stability.

• **Hybrid Strategies:** Combine best features from multiple approaches.

• **Risk-Adjusted Sizing:** Dynamic position sizing by ATR/price ratio.