THOR FINANCIAL TECHNOLOGIES

Signal Processing 101

How We Manage Money Without Gut Feelings

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THOR FINANCIAL TECHNOLOGIES

January 2026

thorfunds.com

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INTRODUCTION

Why This Guide Exists

I don't manage money with predictions. Not with gut feelings. Not by watching CNBC and reacting to whatever the talking head du jour thinks about the Fed.

I manage it with a signal.

This guide will explain exactly what that means — how we apply the science of signal processing to financial markets, why it works, and why most investors (even professionals) are doing it wrong.

I'm not going to sell you on a magic formula. I'm going to show you why the way most people invest is fundamentally broken, and how engineering principles — the same ones inside your noise-canceling headphones — offer a better path.

If that sounds interesting, keep reading. If you'd rather trust your gut, this isn't for you.

CHAPTER ONE

Why Most Investors Lose

Let's start with the uncomfortable truth.

Most investors — retail and professional — underperform. Not because they're stupid. Because they're human.

The Emotion Problem

Behavioral finance has spent decades documenting the ways human psychology sabotages investment returns. The highlights:

— **Loss aversion:** We feel losses roughly twice as intensely as equivalent gains. A $10,000 loss hurts more than a $10,000 gain feels good. This makes us sell too early when we're winning and hold too long when we're losing.

— **Recency bias:** We overweight whatever happened last week. The market dropped 3%? Feels like a crisis. Rallied 3%? The coast is clear. Neither reaction is based on evidence.

— **Herd mentality:** We buy what everyone else is buying, at the top. We sell what everyone else is selling, at the bottom. Every. Single. Time.

— **Narrative fallacy:** We need a *story* to explain price movement. "Markets fell because of trade war fears." Maybe. Or maybe that's just what the journalist wrote after the fact to fill column inches.

The result? Dalbar's annual study consistently shows average investors earn roughly half the market's actual return over long periods. Not because they pick bad investments — because they make emotional decisions about *when* to own them.

The Math That Should Keep You Up at Night

40% → 67%

A 40% loss requires a 67% gain just to break even

Read that again. If your portfolio drops from $1,000,000 to $600,000, you now need to earn 67% on $600,000 to get back to where you started. Not 40%. Sixty-seven percent.

LOSS	GAIN REQUIRED TO RECOVER
-10%	+11.1%
-20%	+25.0%
-30%	+42.9%
-40%	+66.7%
-50%	+100.0%

This is why drawdown management isn't a "nice to have" — it's the entire game. Over 85 years of market data, if you could avoid just the 10 worst days, $1 invested in the S&P 500 would have grown to $256 — versus $81 for buy-and-hold. The asymmetry of losses is the single most important concept in portfolio management, and almost nobody builds their process around it.

The Buy-and-Hold Myth

Buy-and-hold works — over 30 years, with a cast-iron stomach, and the assumption you won't panic-sell at the bottom. In theory.

In practice, 25-year rolling returns for the S&P 500 vary wildly. 10-year real returns have ranged from +16% annualized to *negative* 3%. If you happened to retire in 2009 instead of

1999, you lived a very different life.

The question isn't whether markets go up over time. They do. The question is whether you can survive the drawdowns along the way — financially and psychologically. Most can't. The data is clear on this.

So what's the alternative?

CHAPTER TWO

What Is Signal Processing?

Put on a pair of noise-canceling headphones. I mean really think about what they're doing.

The headphones contain tiny microphones that constantly sample the ambient noise around you — the drone of a jet engine, the hum of an office, the rumble of a subway car. They analyze the waveform of that noise in real-time using digital signal processing. Then they generate an inverse waveform — an equal and opposite signal — and play it back to you. The noise gets cancelled. You hear only the music.

> **That's what we do with price data.**

From Audio Engineering to Markets

Every asset, when charted over time, is a waveform. It has amplitude (how far prices move), frequency (how often they oscillate), and noise (random fluctuations that obscure the underlying pattern).

The problem is that raw price data is *incredibly* noisy. On any given day, prices move for thousands of reasons — earnings reports, Fed speeches, options expiration flows, algorithmic rebalancing, someone fat-fingering a trade. Most of these movements are meaningless. They're noise.

But buried underneath all that noise is a signal — the actual trend, the real direction, the structural character of the market at that moment. Finding that signal is the entire challenge.

Traditional investing tries to solve this by looking at the noise and telling a story about it. "The market dropped because of China trade fears." "Tech rallied on AI optimism." These

are narratives layered on top of noise. They feel explanatory, but they have zero predictive value.

Signal processing solves it differently. Instead of interpreting the noise, we *remove* it.

The Key Insight

KEY INSIGHT

Constant, steady noise is easy to filter. It's the sudden, random disruptions that are hard.

Think about your noise-canceling headphones again. They're excellent at blocking the steady hum of a jet engine — a consistent, low-frequency noise. They're less effective against someone suddenly clapping next to your ear — a sharp, unpredictable burst.

Markets work the same way. Steady, low-frequency trends are identifiable and investable. Random daily noise is not. The trick is converting the chaotic, high-frequency mess of daily price data into a lower-frequency waveform where the real trend becomes visible.

That conversion — from high-frequency noise to low-frequency signal — is what our system does. We call it **The Signal.**

CHAPTER THREE

How The Signal Works

Here's the conceptual framework. I'm going to explain the *philosophy*, not the proprietary details — because the philosophy is what matters.

STEP I

Convert Noisy Data to a Smooth Waveform

Raw price data is chaos. It's red noise — random, jumpy, impossible to act on directly. Step one is transforming that raw data into something that looks more like a clean waveform.

We use momentum-based transformations to capture the underlying strength of price movement while smoothing out the day-to-day randomness. Think of it like converting a scratchy AM radio signal into clean digital audio. The information is the same — you're just removing the static.

STEP II

Apply Digital Signal Processing Filters

Once we have a smoother waveform, we apply signal processing filters adapted from electrical engineering and physics. These aren't your grandfather's moving averages.

Traditional moving averages treat all data points the same — last Tuesday's close counts just as much as today's close in a 50-day average. That's like designing noise-canceling headphones that treat all frequencies equally. It doesn't work. Different frequencies require different treatment.

Our filters are designed to isolate specific components of the waveform — separating the cyclical structure (the music) from the low-frequency drift and high-frequency noise (the static). The result is a clean, oscillating signal that rises and falls through definable turning points.

STEP III

Detect Regime Changes

This is where it gets interesting. The filtered signal doesn't just tell us whether the market is up or down today. It tells us when the *character* of the market is changing.

We're looking for structural turns — moments when the signal confirms that a genuine inflection point has occurred. Not a blip. Not a one-day reversal. A confirmed change in regime from risk-on to risk-off, or vice versa.

The system requires confirmation before it acts. It doesn't flip on every wiggle. It waits for evidence that a real turning point has formed — a trough that's been validated, or a peak that's been confirmed. Only then does it change positioning.

STEP IV

Act

When a regime change is confirmed, the positioning changes. Simple.

— **Risk-on:** The Signal shows a confirmed uptrend. Be invested.

— **Risk-off:** The Signal shows a confirmed downturn. Step aside.

The beauty is in the discipline. There's no debate. No committee meeting. No "well, the fundamentals look okay but the technicals are concerning." The Signal either says risk-on or risk-off. We follow it.

What Makes This Different

We use science, not math.

Math is linear. Markets are not.

Moving averages, RSI, MACD — these are mathematical tools designed for linear systems. Markets are nonlinear, cyclical, and chaotic. They require tools borrowed from physics and engineering — the same tools used to process audio signals, radar data, and telecommunications.

We're not laying rulers on charts. We're decomposing waveforms.

CHAPTER FOUR

Regime Changes Explained

A regime change is when the fundamental character of the market shifts. Not a pullback. Not a bad day. A genuine change in the underlying trend.

Think of it like seasons. Summer doesn't become winter because of one cold day in August. But when September comes and the days keep getting shorter and the temperature keeps dropping, at some point the season has changed. That's a regime change.

Why Regime Changes Matter

Most investment losses happen during regime changes that investors fail to recognize — or recognize too late.

Consider the timeline of a typical bear market:

1. **The signal shifts.** Something changes in the underlying structure. Most people don't notice because the headlines are still positive.

2. **Early decline.** The market drops 5-8%. Pundits call it a "healthy pullback." Investors buy the dip.

3. **Acceleration.** The decline deepens. Now it's 15-20% and the narratives shift to panic. Investors who bought the dip are underwater.

4. **Capitulation.** The market falls 30-40%+. Everyone sells at the bottom.

5. **Recovery begins.** The signal shifts again. But investors, now traumatized, sit in cash while the market rallies 20-30% without them.

This pattern repeats like clockwork because it's driven by human psychology, not market mechanics. The Signal is designed to detect phase 1 — the structural shift — and act before the crowd figures out what's happening.

Historical Examples

2008 Financial Crisis: The S&P 500 fell 57% from peak to trough. The character of the market had fundamentally changed months before Lehman Brothers collapsed in September 2008. A signal processing approach that detected the regime change early — even if imperfectly — could have avoided the bulk of the devastation. The math: a 57% loss requires a 133% gain to recover. The S&P didn't reach its pre-crisis high again until 2013 — five years later.

March 2020 (COVID Crash): The market fell 34% in 23 trading days — the fastest bear market in history. This was an extreme, sudden disruption — more like a clap next to your ear than a steady hum. Even here, the structural deterioration was detectable in the signal before the worst of the selling. More importantly, the signal's ability to detect the *recovery* — the regime change back to risk-on — was equally valuable. Many investors sat in cash well into 2021, missing a historic rally.

2022 Bear Market: The S&P fell 25% over nine months as the Fed aggressively raised rates. This was a cleaner, more sustained regime change — exactly the type of environment where signal processing shines. The steady, grinding nature of the decline was highly filterable. The subsequent recovery, when it came, was also detectable.

In each case, the question isn't whether you could have timed the exact top or bottom. You can't. Nobody can. The question is whether you could have detected the regime change early enough to avoid the worst of the drawdown and re-enter near the start of the recovery. That's the goal. That's what The Signal is built to do.

CHAPTER FIVE

The Signal vs. The Noise

If you watch financial media for an hour, you'll hear approximately 47 reasons why the market will go up and 47 reasons why it will go down. Every one of them sounds plausible. None of them are actionable.

That's noise.

Why Most Indicators Fail

The investment industry is obsessed with indicators — moving averages, oscillators, sentiment surveys, economic data. Most of them fail as timing tools for a simple reason: they were designed for linear systems and applied to a nonlinear one.

A 200-day moving average doesn't "know" anything about market regimes. It just calculates an average. When the market drops below it, pundits say "the trend has changed." When it bounces above, "the bull market is back." These signals are slow, laggy, and generate enormous numbers of false positives in choppy markets.

RSI tells you when a market is "overbought" or "oversold" — but markets can stay overbought for months during strong trends and oversold for months during crashes. The indicator gives you information, but not *actionable* information.

The problem with all of these tools is that they're reacting to noise, not detecting signal. They're measuring what price *did*, not identifying when the character of the market has *changed*.

Structural Turns vs. Daily Wiggles

Here's the distinction that matters:

Daily wiggles are noise. The market drops 1.5% on a Tuesday because of options expiration and someone on CNBC says it's because of "trade war fears." It rallies 2% on Wednesday because of short covering and the headline says "investor optimism returns." None of this matters. None of it is investable.

Structural turns are signal. The underlying trend has reversed. The cycle has changed. The waveform has inflected. This happens infrequently — a few times per year in most markets — and it's the only thing worth acting on.

The entire design of The Signal is built around this distinction. We're not trying to trade every day. We're not trying to call every 3% pullback. We're trying to identify the handful of moments each year when the regime genuinely changes — and position accordingly.

THE PHILOSOPHY

Few trades. Regime-based. Not reactive.

Stay invested unless the evidence mounts to change. When it changes, act. Then wait for the next confirmed turn.

CHAPTER SIX

The Signal in Action

Theory is nice. Let's talk about what The Signal is actually doing right now.

THLV: Sector-Level Regime Detection

THLV — the THOR Equal Weight Low Volatility ETF — monitors 10 U.S. equity sectors and applies The Signal to each one independently. Sectors showing risk-on regimes get equal weight in the portfolio. Sectors showing risk-off get removed.

Current positioning (as of late January 2026):

SECTOR	SIGNAL STATUS
Materials (XLB)	🟢 Risk-On
Energy (XLE)	🟢 Risk-On
Industrials (XLI)	🟢 Risk-On
Consumer Discretionary (XLY)	🟢 Risk-On
Consumer Staples (XLP)	🟢 Risk-On
Healthcare (XLV)	🟢 Risk-On
Utilities (XLU)	🟢 Risk-On
Technology (XLK)	🔴 Risk-Off
Financials (XLF)	🔴 Risk-Off
Real Estate (XLRE)	🔴 Risk-Off

7 of 10 sectors are risk-on. Technology, Financials, and Real Estate are off.

Think about what that means. The S&P 500 is roughly 35% technology. A traditional index fund forces you to hold that full tech weight regardless of what's happening. THLV's Signal detected weakness in tech and rotated *out* — systematically, without emotion, before the deterioration deepened.

That's not a prediction. It's not an opinion about whether tech is "overvalued" or "due for a correction." It's what the data shows. If tech recovers and the signal flips back to risk-on, the system will rotate back in. No ego. No narrative. Just the signal.

THIR: Index-Level Regime Detection

THIR — the THOR Index Rotation ETF — applies the same signal processing approach at the index level, rotating between the S&P 500, Dow Jones, and Nasdaq 100.

Current positioning:

INDEX	SIGNAL STATUS
Dow Jones (DIA)	🟢 Risk-On (~50%)
S&P 500 (SPY)	🟢 Risk-On (~50%)
Nasdaq 100 (QQQ)	🔴 Risk-Off

The system is running approximately 50/50 between the Dow and S&P 500, with the Nasdaq effectively turned off. Why? Because the Nasdaq is roughly 60% technology, and The Signal detected a regime change in tech.

Note: THIR can go to 100% cash when all three indices show risk-off. That capability — the ability to step completely aside during sustained market declines — is the ultimate drawdown protection tool.

What This Demonstrates

Both products show The Signal doing exactly what it's designed to do:

1. **Detecting regime changes** at the sector and index level

2. **Rotating systematically** based on confirmed signals, not predictions

3. **Reducing exposure** to areas of weakness while maintaining exposure to strength

4. **Acting without emotion** — the system doesn't care about headlines, narratives, or consensus

The positioning can change next week if the data changes. That's the feature, not the bug.

CHAPTER SEVEN

Getting Started

If you've read this far, you understand the problem (emotion destroys returns), the solution (signal processing removes the emotion), and the application (regime-based positioning that detects structural turns).

The question is what you do with this information.

Follow The Signal

We publish regular updates showing exactly what The Signal is detecting — sector regimes, index positioning, and regime changes as they happen. The same signals driving our ETF strategies.

Subscribe to The Signal newsletter at **thorfunds.beehiiv.com** for weekly signal updates, regime change alerts, and analysis delivered directly to your inbox.

Learn More

— **Website:** thorsignals.com — Full breakdown of our approach, current ETF positioning, and educational resources.

— **THLV & THIR:** Our ETFs are the signal processing approach in action. Learn more at thorfunds.com.

— **Follow on X (Twitter):** @Bradr_thor for real-time signal updates and market analysis.

The Bottom Line

Markets are waveforms. Noise-canceling technology works. Human emotion is the enemy of long-term returns.

We didn't invent signal processing. We just applied it to the problem that costs investors more money than any other: the inability to separate signal from noise in real time.

The Signal doesn't have opinions. It doesn't watch CNBC. It doesn't panic. It doesn't get greedy.

It detects. It confirms. It acts.

Follow The Signal, not the noise.

Brad Roth is the Chief Investment Officer at THOR Financial Technologies. THOR's ETFs —
THLV and THIR — apply signal processing to sector rotation and index allocation. Learn more
at thorfunds.com and thorsignals.com.

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THOR's systematic approach does not guarantee profits or protect against losses in
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Investors should carefully consider the investment objectives, risks, charges, and
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