Coffee Rings, Markets, Pencils, Mathematics, Physics, And Capital Flows

By Pallas Boreas of Polar Sun Research

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Website: https://polar-sun.xyz

email: psr@polar-sun.xyz

Store: https:ko-fi.com/psr



$$KFI = log10(m*K*D/\eta)$$

How Do I?

How do I capture the rate of change in price movement without lag? This question triggered months of study of mathematics, researching market theories and lots of pondering. Luckily, I worked in IT during and after the Dot Com Bubble and I have improved those skills since or my Grade 10 math would have crippled this discovery Iam leading up to. Mathematics is not so hard now. I reverse engineered it using the logic developed over the years. I joke that I reverse engineered it through programming since the logic is the same. This journey has crossed paths with fractals, physics, geometry, algebra, and also delving deep behind AI. To clear the smoke around the AI delusion; it uses probability mathematics which has a lineage too the mathematics used by casino gamblers. It is impossible for probability to be consistent and accurate. LLMs are a black box meaning they cannot be opened, looked inside, and know what is running inside. It is not a question of when they will go “rouge” but when. Probability demands it.

A lot of grabbing market data, and going through equations with pencil and calculator. A lot of dead ends that in hindsight were necessary. It can be easier to eliminate to find the nugget then look directly for it. Hence I sluiced a lot of dirt to find the gold. Iam of the reductionist school. Initially I was thinking of using AI as the anchor and eventually got wise to that silly idea. I learnt enough Python, I learning Go and R as I wrote this. All that shell scripting through the years paid off.

Two things that I instinctively knew were on the correct path were fractal market hypothesis and volume based theories. I have long been fascinated with fractals and and as I studied the markets I concluded volume was the main physical gear that turned the machine; liquidity. To measure introduces lag. I wanted a real time indicator that captured the model forming in my mind. As any first-person shooter player knows; lag kills. If I had this idea then some one else surely had also thought of it and had something I could use and I went looking for it in the valleys and on the peaks. I didn’t

find what I was looking for. I started thinking of hydraulics and started looking for the mathematics, the premise being that a physics equation was needed for what I see as a physical system. I came across the Reynold's Number and knew with adaptation it was the answer. They Reynold's Number (Re) is used in fluid dynamics to model the flow of fluid through a pipe. Using it, the number is referenced to a threshold table to find the flow of the fluid; Laminar, Transient, Turbulent.

Re

The formula is as follows;

$Re = p*V*L/\mu$

where

- p = density of the fluid
- V = velocity of the flow
- L = length of the flow/pipe and if in a pipe there is the roughness of the pipe to be considered where a tool is Moody's Table
- μ = the kinematic viscosity which is energetic (kinematic) resistance to the flow

Thus, it is a ratio between inertia forces (or kinetic agitation) to the viscous forces.

Reynold's Number is used with thresholds of flow state;

Flow State	Threshold
Laminar	>= 2300
Transition	>2300 <4000
Turbulent	> 4000

Notice how large the number is. Unmanageable for a trader that needs a mental picture immediately formed with a glance. While refining the KFI equation the quickness of the mind to mentally determine a state of flow was only second to accuracy. It took days and days to determine the mathematically pure and correct way to do it. A second consideration was speed of calculation by a computer and a mind. Minimal operations so that the calculations fits in less CPU cycles, minimal variables so less memory access times. This matters when a second counts or for algro trading milliseconds.

Adopting Re to the market was approximately a two week process. Difficult and magical. I needed help because at this point I felt impossibly over my head and I still to this day Iam amazed it was discovered by … me. Honestly I consider the equation a gift from the Divine. It is not reasonable that I did this without help from above as Iam not that capable nor do I have the background. My background is construction, history, trolling, geeking out, and martial arts. I spent months relearning high school math and more advanced again discovering that calculus is basically fake math. Bring out the pitchforks; I have a sword and love a challenge. Linear algebra still requires thought, feels contrived, while I found a love for geometry. It is these wooden, intellectual masturbation textbooks forced upon promising youth that many intelligent youth are turned off by math which is nothing more than symbolic logic using numerals. Through this process I got double edged help from AI. One last background filling story before I attempt to articulate the KFI equation, since AI (Authentic Idiocy) is the Bug Hype at present.

AI is useful as a natural language interface search engine to a database. It is nothing new, only the terminology, capital expenditure, and scale is. The core technology is NLP (Natural Language Processing) and I was reading papers about it from universities (confused and clueless many times) in the early 2000s. NLP covers a wide range of practical uses. Pair it with iterative probability Markov Chains through machine learning, vector databases, and illusions akin to opium addicts chasing the dragon. This insane promise that a silicon machine can have intelligence or psuedo-mathematics can have intelligence has been a zealot pilgrimage since the 1960s.

In Over My Head

Being in over my head initially, which has never stopped me before, I started using it to extract references, terms, concepts, to research further to develop a system too loot the looters. Find a book to read the subject, read web pages, frustrate myself with AI as an idiotic devil's advocate to fill in the gaps, repeat so many times the loop button got stuck. At some point doing the standard equations of finance concerning statistics and price movement by hand, I thought "this is not the way to do it". Shortly after I came across Re and had an inspiration - "this is what I was looking for". I started running the idea and concept through AI. First, the fundamental revelation must be mentioned. As I was doing some linear algebra a realization happened; "it is not an algebra problem but a geometry problem". As said earlier the next conclusion was to find working equations in

physics as my conceptual image was of a system that behaved as a physical natural system.

Two concepts have to be said to understand my thinking; the stock market is a geometry problem and time is not linear but an arc which is the next step in my research. I loaded NotebookLLM with mathematics and market theory content. One day it asked if it should make a document. Why not? Not long after I switched too Claude because was is better for this domain at the time taking the generated document with me and it eventually becoming the *KFI ML Handbook*. Over a hundred iterations and very likely two hundred, over a few months, and I had an acceptable document of the theory with a working PineScript indicator for Trading View. Originally, the question "how do I capture the rate of change in price movement without lag?" was for ODE options which after months became more significant going through a metamorphosis into a state machine. An incredible journey of frustration, chasing my own tail, elation, success and failure sprinkled with an amount of learning that surprises me today. It is now intuitive to me that would seem of a bunch of numbers to others, yet these symbols hold a database worth of information to me and has become an intimate part of me. To the trader, less but still of value the investor, is a set of unique gauges that gives an "alpha" edge and including the academic or researcher, even the amateur curious, is a way to see past the noise and see the internals with a plethora of derivatives which attests to it's validity.

AI helped me with the journey in two ways. It cut down the time of study by providing clues and terms for what I needed to know or curiosity which itself leads to unexpected knowledge which gives more threads to weave a web. They rarely give a correct or useful first answer. Which is how it helped in the second way. By constantly correcting, arguing, and in opposition to it's idiocy. Which plays into my psychology and I bit hook, line, and sinker. I do not think I accepted one suggestion without diligence while the machine burnt enough resources to sustain a small country so I could have a devil's advocate which was my own curious research on the capabilities of idiocy. Sometimes it surprises you! I had it do many tests which I have no clue if the results it spewed out are accurate suspecting they are as reliable as a politician's promise. Some are in the *KFI ML Handbook*. I verify the logic is correct in the document but since I did not see the math it used and did not do it by hand at least once; I do not trust the tests. The point was to see if I could find any holes or if it could, which a few times it's criticisms were features or I had a thought out purpose. For example if there is zeroes in the numerator it zeroes out, or if the denominator is zero it obviously is a divisible by zero error. AI argued this was a problem. I countered if there is no trade anything >0 would be a serious accuracy

problem because it would mean it outputted a number when there was no trades, a zero input, and nothing to measure. Creative accounting is not an option in a serious instrument. A built in circuit breaker without it being designed in or even thought of, inherit in the structure of the logic. Beautiful.

The Meat Of It

Enough story telling, I want to get to the meat of it. Envision Volume as the variable in the markets as a fluid in a pipe, this is the amount of capital flow commonly called liquidity. In the KFI this is *m=mass* or *p=pressure* in fluid dynamics. Both are displacement. *m* is Volume of the present candle. I will interchange fluid and capital for it to be easier to visualize from here on. All input is OHLCV for speed and functionality and are the physical analogues of the instrument while being the minimum and maximum of price data with minimal input.

For fluid to travel it will have a *velocity* which is modeled as kinetic agitation, *K=High-Low + |Close-Open|*. Absolute number is used to keep it positive as it is a sum of energy and not direction so it negates *Close-Open* diminishing the velocity and energy of the price movement when negative. Capital is traveling through a conduit of price boundaries and as in fluid dynamics the length of the flow or the walls of the pipe limits the flow with both being interchangeable depending.

D=High_n - Low_n where *n=lookback period* which I typically use 5 (candles) to minimize lag and provide price memory. This is the structural range the price has moved within the specified period. I think of *D* as diameter.

The opposing force of a fluid is the *viscosity* of the fluid itself, roughness of the pipe, and the incline or decline of the conduit, to simplify and keep the state machine as direct as possible to fluid dynamics. Viscous resistance here is population Standard Deviation as the sole variable in the denominator using Greek Eta (η). This is simply *Close_n (*for n=5 that would be the 5 Closes of 5 candles).

As the Reynold's Number the result becomes a large number and much bigger in high Volume stocks reaching in the hundreds of millions. Being too large for quick and easy comprehension by the mind. While, it does not matter much when being analyzed statically and historically it is useless when the intention is to be used in real time with as little lag as possible otherwise creating cognitive lag. To counter the large numbers the equation is scaled with *log10*. I also found that it had to be scaled for the threshold table and little forgettable things as development progressed.

As the rest of the equation, decisions were made because of necessity and my guiding principles of keeping to first principles, minimal operations i.e. avoid squaring which would require square rooting, simplicity, mathematical purity.

Kinetic Agitation is very difficult to define quickly, and even undergrad physics students have a hard time to grasp it looking at internet forums. Thermal agitation is interchangeable mostly as without heat there is no movement but thermal is not relevant here. We are interested in the movement of price as a velocity and not it's expansion or contraction from the thermal domain; technically no heat is generated or lost. Nothing exists in a vacuum and are only found in nature as a short lived transitional state such as those found in convection. It usually exists in extreme conditions of chaotic states. So any action upon the background resistance (due to particles and some may say tension) is an agitation against it and for their to be action or movement it has to be kinetic. In the *KFI* agitation is *Eta*, population standard deviation which is an over complicated final step equation of variance. Iam not pleased with using it but there is nothing better as far as I know and could find and that doesn't matter because it works beautifully. Kinetic is hardly properly defined itself in physics. If there is no energy in movement it is potential and if it is in movement, or better yet; action then it is kinetic. Keep it simple! Here it is defined as the energy in the price movement agitating the resistance (η) which is volatility and being *StdDev,* is a compressed form through square rooting.

When reading the gauges *Eta* is what *m* and *K* are acting against. If *K* is high and *Eta* is low you have a slip stream situation. The capital has little volatility too counter inertia, a high *m* will give "weight" to the movement, or it is not hollow and this relation of *m* is true in all conditions. High energy, high mass, low resistance will create sudden large price movement. In physics this is a slip stream. Conversely low *m* and *K* with a high *Eta* will result in low, short conviction movements where the flow becomes Sub-Laminar slowly chugging along not being able to subsume the resulting eddies. The chart will show sideways movement and the ratios will determine the vertical distance of the peaks and troughs. *D* is whether there is room for the forces to act in the price conduit. As a pipe fills the pressure creates compression. When the flow fills the pipe (*D*) and the pressure cannot be compressed within the structure anymore you have what is called a fracture. A fissure widens, becomes a crack, the fluid at a higher pressure then outside of the container rushes out as a gas or liquid, depending on the thermal state and diameter of the pipe, viscosity of the fluid, etc., which will determine the suddenness and violence . Oil pipelines are X-rayed for unseen fissures because of this.

Here it is a derivative; *Cr=K/D*, standing in as compression ratio. A validation of this equation is the amount of derivatives that fall out of it effortlessly. Discovery and observation of the instrument in action reminds me of chess, a game I have played since a teenager. Simple to learn, a lifetime to master.

KFI & Re Comparison Table

KFI	Re
$log10(m*K*D/\eta)$	$p*V*L/\mu$
m as Volume	p as pressure or density of the fluid
K as kinetic agitation, the energy of the candle	V as velocity of the flow
D as the bid and ask range of the candles, the boundary range of the price	L as length of the flow or diameter of the pipe
η (Eta) as as population Standard Deviation, volatility acting as resistance	μ as viscosity an elastic resistance that dissapates energy

Next, is the thresholds of flow states and it was complicated taking a long time to calibrate and adjust it to market reality. Iam less confident about this and I look at the variables and derivatives more then I pay attention to the phase levels. At a 1 minute candle for example the phases can change in a second or less in the right conditions. I always thought of it as alert levels visually or programmatically. They are also necessary because of all the different tiers of stocks, volume levels, whether a stock, ETC, Commodity, hence as one number to cover all the cases is impossible. Here again AI was smoking drugs and I settled on -1 down the tier ladder and AI was a waste of time and energy. Large was the basis and surprisingly 7.2 Fracture at Large correlates with Gann angles and Fibonacci levels. Being logarithmic of log10 the following table acts as the Richter Scale where every whole increase in numbers is a tenfold increase. By inference from the Richter Scale it means that the higher numbers are not representative which I assert does not mean much as at Gaseous sane boundaries have been crossed and if you are still trading then I don't know what to say.

Threshold Table

Tier	Sub-Laminar	Laminar	Turbulent	Pre-Fracture	Fracture	Gaseous	ADV (Average Daily Volume)
Large	< 6	6	6.5	7	7.2	8.5	>= 50M
Mid	< 5	5	5.5	6	6.2	7.5	5M - 50M
Small	< 4	4	4.5	5	5.2	6.5	500K - 5M
Micro	< 3	3	3.5	4	4.2	5.5	50K - 500K
Nano	< 2	2	2.5	3	3.2	4.5	< 50K

m Divisor

Because of the various equity classes and their resulting volume levels, behaviours, switching between stock, ETF, commodity, will skew m. Commodity class are sold by lots, ETFs by unit so through experimentation I found I had to scale the differing equity classes for m or else the KFI Number lost accuracy and the threshold tables would require further tweaking. The most elegant solution was to divide m by a power of ten.

Stock	ETF	Commodity
1000	100	10

Flow Types

Sub-Laminar is similar to the slip stream conditions mentioned above where there is not enough flow for a smooth river in ratio to resistance. Visualize a shallow creek that is rough on the surface yet the water is not impeded by turbulence. On a chart it is similar to a small sine wave and if you draw a median line it will look smooth.

Laminar is the ideal where mass, energy, resistance, and the conduit is in balance. Engineers strive for this type of flow. On a chart this will give roughly a smooth sine wave

type shape where the peaks and troughs will each be roughly equal drawing a horizontal line across the tops and bottoms.

Turbulent in the present markets is normal for stocks heavily traded. The peaks and troughs lengthen vertically and lagging indicators start losing accuracy, and all the whites noise gets louder drowning out the music. This is where m and F can determine if the movement is empty or has inertia behind it. If *Eta* is low this can magnify the effect of m and K, if high it can bring the flow to calmer behaviour. Turbulent is the first transitional phase where capital pressure had reached a stage that critical mass is possible. At the upper bound the transition becomes quicker.

Pre-Fracture from observation and can be seen on the threshold table, is a short transition and lagging indicators are creating false signals. It is a critical phase and as in nature it is a short prelude to the sudden and violent fracture event. From linear mathematics to chaotic mathematics.

Fracture is an even horizon. The mathematics has changed and the linear has broken. Fluid has reached the structural bonds of the conduit (D) while displacement (m) and energy (K) overpower resistance (η). A visualization is pumping too much water (Volume) through a small garden hose with high Psi and it ruptures at some point along it's length. On a chart this can show up as a morning waterfall. Overnight has created a higher pressure then what was present at Close, a memory, yet the conduit has no liquidity in it. When the capital enters the conduit again this violence creates a fracture. Put fluid in a pipe with the tap full and it will blast into the pipe, spraying and sloshing the inside walls. If an open conduit parts will spill over the walls. Waves and eddies are created and if a high volume with a high energy the time for the initial shock to dissipate is a direct correlation, graphed as a high incline curve. An engineer will also point out the pipe is being stressed something very important for say; an oil pipeline. The proper way is a gradual increase in volume and flow rate. It can be tested with a garden hose and water tap.

Finally, is gaseous where all models are useless. Liquidity has transitioned from a fluid into a gas and has become a capital steam engine powered by dirty coal spewing out black smoke. A Black Swan event is in this state and the market has become unmeasurable in the present. I could be funny and term it the shock and trauma headline generator if my sense of humour was that dark. Lagging indicators and financial equations using complex operations have long stopped being useful or having a semblance of accuracy. I have not seen this much and it quickly levels down from this

phase. Physical conditions for a capital flow have turned into unrestrained movement without internal or external bonds.

Conclusion

The theory behind the Kapital Flow Instrument is hard to explain for me because Iam not an engineer, physicist, economist, and strive to be a competent amateur at worst. Iam a man that discovered something that was already there solving a problem and wouldn't give up until it was solved. I have a book worth of thoughts, ideas, and words in my mind so it is best to continue with the hard no fluff writings later. Originally the *KFI* was for zero day options until I realized the significance from a simple change of concept; "it is a geometry problem" to something greater.

KFI ML Handbook

Available for free to download at: https://ko-fi.com/s/4ce18ed646