



$$\frac{\partial \mathbf{v}}{\partial t} + (\mathbf{v} \cdot \nabla) \mathbf{v} = -\frac{1}{\rho} \nabla p + \frac{\eta}{\rho} \nabla^2 \mathbf{v}$$

...

1 Executive Summary

August was a hot month in the northern hemisphere with everyone who could well away from their offices. In fact it was the hottest August ever and the second hottest month to date. The need to redouble efforts to control climate warming is obvious.

Not much happened in August, but what did happen was worth taking note of.

1. The war with Iran is headed towards major regional conflict
2. Russia is showing signs of insanity
3. Trump wants to attack everything other than the US's enemies
4. AI marches on but manages to cause lots of concerns
5. The bond market is unhappy
6. An important age cohort is bowing out

It looks to be a turbulent fall.

2 The Wars

Putin is stuck in an intractable war he cannot win but dare not lose. His army's advance has ground to a near halt, with marginal gains in one sector balanced by marginal losses in another. Achieving this result has cost the Russians a quarter million men over the last six months. The Russians have shifted, apparently, from massively cost ineffective terror attacks on cities to more strategic attacks on Ukraine's logistics and grain exports. In this regard they are learning from the Ukrainians who have been pummeling Russia's refineries, logistics, oil and grain exports. Their attacks reach even the Arctic circle. This campaign has cut about 25% of Russia's gasoline supply and pushed the Russian economy towards recession. On the technology side, Russia has upgraded from piston engine drones to jet powered drones. Ukraine has countered with interceptor drones. Drones are evolving from a disruptive military technology into a vital part of the toolkit but one which requires an integrative combined arms approach to be effective.

Putin's political party is calling for the restoration of Russian autocracy, permanent militarization of society and a state of permanent war with the West. In short,

they want a return to Stalinism and the Cold War - remembered by them as the glory days of Russia. Moving off fossil fuels, rearmament and political consolidation are Europe's necessary strategic counters to Russian nationalist nostalgia.

Trump is stuck in an intractable war with Iran, which he cannot win but must not lose. The ballyhooed deal which was to have ended hostilities has to no ones surprise proved to be ballyhoo and little more. There is probably a real peace faction even in the governing team in Iran. But power rests with the revolutionary guards and their leadership believes they are on the verge of establishing a new Caliphate to rule the Middle East. They likely also believe a peace which ended their claims to control society would result in them losing power and possibly being massacred by a vengeful populace. They intend to control the Straits of Hormuz and by that means the oil of the the Gulf States and the economies of Asia. Their proxies the Houthis will control the Straits of Bab-el-Mandeb and thus the flow of traffic between Europe and Asia, Their proxies in Iraq and Lebanon will control those countries and create a threat which will keep Israel on the defensive. Support from Russia and China will flow in through the Caspian sea, cementing Iran as their crucial ally in the region. With that mirage to dazzle their eyes why make peace with Trump - a man of proven perfidy who has been abandoned by his closest allies.

Indeed Trump's reaction to these threats has been to start a trade war with Canada and plan a monumental arch to desecrate the skyline of Washington. In IRGC thinking - If God Wills It, Trump can no more stop the coming of the Caliphate than could Yazdegerd III.

The difficulty is, of course, that what Trump cannot do the the US Navy is designed to accomplish. It has re-established a blockade of Iran's seaborne trade even as it has cleared mines from the Straits of Hormuz. Currently some 500 ships pass the Straits monthly and Iran attacked only 2% of them with no vessels lost in August. On one day in August the navy escorted through the straits tankers carrying about 84% of daily ante-bellum volume. The Iranian rial has lost half its value and impoverishment of the Iranian population is broadly anticipated. The regime has sent its thugs to parade in the streets to remind the populace of the lethal consequences of protesting their plight. In counterpoint, the Houthis have hit a Saudi vessel with a missile at a distance of nearly 1000km from Yemen's border. The three major Sunni powers of Turkey, Saudi Arabia and Pakistan have joined together in a mutual defense pact. With Turkey contributing a NATO quality army, Saudi limitless economic resource and Pakistan nuclear armed missiles this is a pact with significant heft. We wonder if Egypt will join - adding its demographic strength to the combination. In fact, Egypt is directly impacted by the Houthi power plays which have crushed its revenues from the Suez Canal - normally Egypt's best foreign

currency earner. However, Egypt under General Nasser mounted an invasion of the Houthi heartland. This was as successful as Nasser's other military adventures and Nasser's successors are not eager to try again.

Thus in both conflicts, the limitations of kinetic means is causing a shift to economic warfare. These tools can prevail, but only with substantial delay. As such, they bring the realization that these wars will not soon end. That is bad news for the economies of Asia and the wheat importers of the world. But it is good news for providers of solar and wind power equipment and electric cars. Whenever, however and with whatever long term damage to oil production facilities the current conflict may end, it is clear no long term stability will emerge and competitive economies need better control over their energy inputs than shipments from the Mideast can provide.

President Xi of China has begun a program of diplomatic outreach. It will be interesting to see if this is position tending or more substantive. At a minimum it indicates that, for the first time in several years, the domestic situation no longer demands his primary attention.

3 The Elections

The third war is the ongoing one between Trumpers and the Democrats. The public is dismayed by high gas prices and rampant megalomania in the White House. The stink of brazen ongoing government cover-up of the misdeeds of a rich connected child predator is the wiffiest of scandals. And a constant stream of heart wrenching stories of needless deaths from vaccine preventable childhood diseases keeps Kennedy's controversial health policies firmly in the limelight. The election looks to be a classic shellacking of incumbents. With their unerring sense for how to lose the political moment, progressives are electing democratic socialist firebrands in deep blue districts, thus ensuring that the more critical purple districts remain contestable by Republicans who have no difficulty sowing skepticism towards democratic socialists. Pundits expect a hung Congress with a Democratic House matched with a Senate balanced on a hairs edge between the parties.

The Supreme Court continues putting its finger heavily down on the Republican side of the electoral scales. Its latest unsigned 6-3 opinion invited the President to continue meddling in State elections - an activity for which there is no discernible Constitutional authority for the President to play a role. But the Robert's Court passed that barrier years ago - essentially asserting to itself the power to amend the Constitution as it sees fit.

Trump held a raucous party get together in Texas where he urged Republicans

to engage in election fraud to retain their control of Congress. While he was busy undermining US Constitutional order, Iran's allies the Houthi's seized control of the Straits of Bab-el-Mandeb giving them control over trade between Europe and Asia. This move was accomplished in a week long maneuver which pushed back the Government of Yemen forces, a Saudi ally, which has formerly controlled the region. It is unlikely such a quick advance has yet consolidated Houthi control and the next two weeks will be of considerable importance for determining ultimate control of this strait. As we have pointed out there are a number of critical straits around the world and setting off a scramble by regional powers to control them risks a global economic depression.

The month closes with the sad news of the passing of Dolly Parton, aged 80 and the country's beloved Queen of Country Music. Parton was musically precocious - originally developing her talent through church singing at age 6. She was making radio appearances at 10 and cut her first single at 13. Her career went from success to success and continued vital to her final year. Along the way the greatest competition to her musical talent was her classic good looks which held the audience's eye as firmly as her voice and songs claimed their ears. The authentic voice of poor rural white Christian America, Dolly spoke for a demographic Trump often claims to represent. She was well known for her charitable activities focused on poverty relief, promoting education, interpersonal tolerance, animal welfare and medicine. Her early charitable support for the development of the mRNA vaccine was a key contribution to bringing the global pandemic under control. Subsequent work has successfully developed mRNA vaccines that provide a promising tool for control of cancer. The world will be drawing dividends for decades to come from Dolly's beneficence. A child of the 1946 peace, Dolly's passing marks the sunset of a demographic cohort which has long been a vital and anchoring element of the American scene.

Still alive and still unseen by the public, the Republican's former senate leader Mitch McConnell continues to recuperate at home. McConnell began exhibiting signs of infirmity which could be either early Parkinsonism or small cerebrovascular incidents about two years ago. About two months ago he was rushed to the hospital by emergency responders who initially reported a cardiac arrest. Subsequent medical bulletins clarified his condition as a fall complicated by pneumonia but were silent about precipitating factors to the fall. Provision of minimal public information has fueled a lively, sadly partisan, amount of speculation as to how incapacitating is McConnell's condition. A child of 1942, McConnell's ambiguous drawn out decline is classic for his age cohort.

4 The Economy

A stalled war; elevated oil prices which elevate food and every other logistic sensitive product; and rising inflation. The bond market has had enough. The ten year note is flirting with 5%. Historically, September interest rate increases have been followed by volatile Octobers in the equity market. The bond market bears watching.

Tax cuts; A war; An AI capital investment boom. All are stimulating the economy. It continues forging ahead even as signs of overheating appear.

5 AI

A major research announcement has broken concerning the Navier-Stokes equations. These are a family of differential equations that describe fluid flow. They are strongly nonlinear with sensitive dependence on initial conditions - qualities which make them difficult to work with. Restricted to flow in the plane for an incompressible fluid it has been known that the equations remain smooth and do not develop singularities. On the other hand, compressible fluids in three dimensional space definitely do develop shocks as many aircraft have demonstrated over the years. (In this case the singularity manifests as a sonic boom.) So the open question was whether three dimensional incompressible fluid flow would develop singularities.

For a long time the expectation was that three dimensional incompressible flow would not and theorems established that it would at least require some time to do so. But about 10 years ago work by Terence Tao turned the thinking to be that singularities likely would develop. Work by Diego Cordoba and Luis Martinez-Zoroa, two Spanish mathematicians, developed techniques which indicated a possible route to proving singularities. Last week two teams announced they had completed the proof of singularities. Both teams relied heavily on large language models to achieve this result.

Research announcements describe a massive effort with 10,000 threads running for multiple days. Controversy exists as to whether this was independent work or whether one team benefited from the work of the other. Computer assisted proofs are not new. Such a proof was developed for the Four Color Map Theorem in 1976. This effort uses the machine to assist with the reasoning and not just to compute cases. It is an important advance on a classic research topic and the essential contribution of AI is noteworthy. Also notable is the contribution from Lean. This is a system for validating proofs and software. Lean itself has, in the past, had bugs which resulted in it mistakenly validating flawed proofs. So human verification will still be required, but the researchers believe that will be forthcoming.

The real prize with Navier-Stokes would be new insights into the phenomena of turbulence. That potentially could have significant economic consequences. This result is not that, but it is an important step towards better understanding of fluid flow.

The Navier-Stokes problem was one of the problems for which a Millennium prize was established. Early press reports made it sound as if AI had broken the problem on its own. Actually the result seems better characterized as an effective man-machine collaboration. One of the researchers has characterized it as a Kasparov-Deep Blue moment (i.e. the moment when the chess championship was won by a machine.) That is a generous acknowledgment of the machine's essential contribution, but the analogy goes only so far as there are substantial differences between collaborative science and competitive game playing. Among the important differences, validating that a line of play results in checkmate is easy. But a proof is not just a long formula in propositional calculus. It must also be structured to create insight and comprehension. That structuring currently requires human input. But this success certainly suggests that for a class of problems in the future rapid progress is likely to emerge from effective human-machine collaboration. As the research papers come out and experts assess them it will be interesting to see how this milestone comes to be understood.

In recent years we have seen two heroic mathematical achievements result from solitary efforts by sole contributors: the proof of Fermat's Last Theorem and the resolution of the Poincare Conjecture. Are we at the end of the heroic age in mathematics? Probably not. But we are likely at the dawning of an age where heroes will increasingly require outfitting with the best that technology has to offer. Numerical mathematics has of course already been there for seventy years. The last significant paper-and-pencil computation was probably von Neumann's analysis of the design for the hydrogen bomb.

6 The Capital Markets

The ten year note was off 11% and Gold rose 10% as war and inflation fears hit the market. International emerging equity was the strongest performer in the equity group, up nearly 4.6%. It was followed by large cap growth at 3.2%. Otherwise the markets pretty much marked time.

Table 1: Recent Performance

Asset Group	Asset Class	6-month trend	3-month return	1-month return
Equity	US Large Cap	rising	1.41%	2.72%
	...Large Cap Growth	rising	-0.54%	3.22%
	...Large Cap Value	rising	3.78%	2.08%
	...Growth – Value	rising	-4.32%	1.14%
	US Mid/Small Cap	rising	3.09%	1.52%
	Intl Developed	rising	2.53%	1.77%
	Intl Emerging	rising	-2.30%	4.57%
Fixed Income	Treasury 3-7 year	flat	-1.33%	-0.27%
	Treasury 7-10 year	falling	-11.66%	-10.98%
	TIPS	flat	-3.95%	-0.75%
	Municipal	flat	-1.93%	-0.51%
	Investment Grade	flat	-2.88%	-0.04%
	Medium Grade	flat	-0.62%	0.42%
	Preferred	flat	-3.55%	-0.10%
	REIT	flat	-2.19%	-2.36%
Commodity	Euro	flat	-0.71%	0.68%
	Gold	correcting	-2.84%	9.86%
	Crude Oil	volatile	3.35%	0.09%

7 Advice

Rising interest rates and an overheating economy are classic end of cycle signs. The Federal Reserve, however, is unlikely to take action before the elections are over. The capital markets, however, tend to anticipate. Inflation should be watched carefully and investors should be prepared to deal with volatility. As always for the past two years the recommendation is to maintain a high quality portfolio aligned to your specific needs.

8 Cover

The general equation of viscid fluid flow is

$$\rho \left[\frac{\partial \mathbf{v}}{\partial t} + (\mathbf{v} \cdot \nabla) \mathbf{v} \right] = -\nabla p + \eta \nabla^2 \mathbf{v} + \left(\zeta + \frac{1}{2} \eta \right) \nabla (\nabla \cdot \mathbf{v})$$

where $\mathbf{v}$ is the velocity, ρ is the density, p is the pressure, ν is the dynamic viscosity and ζ is the volume viscosity. In the case of an incompressible fluid one has

$$\nabla \cdot \mathbf{v} = 0$$

and the equation simplifies to the classic Navier-Stokes equation

$$\frac{\partial \mathbf{v}}{\partial t} + (\mathbf{v} \cdot \nabla) \mathbf{v} = -\frac{1}{\rho} \nabla p + \frac{\eta}{\rho} \nabla^2 \mathbf{v}$$

In an incompressible fluid the speed of sound is infinite, so this is a mathematical idealization of physical reality but the more tractable nature of the simplified equation substantially assists analysis. The appearance of singularities in the solution, however, cautions that the model can be taken only so far.

Claude-Louis Navier (February 10, 1785-August 21, 1836) initially trained and practiced as a civil engineer. In 1821 Navier formulated the theory of elasticity in a sound form. Its application to civil engineering led to the field of structural analysis. In the next year he derived the fluid flow equation by reasoning from the theory of elasticity. Simeon Denis Poisson (June 21, 1781-April 2, 1840) worked extensively in elasticity and produced a new derivation of the fluid flow equation in 1829. However, he did not particularly develop the theory, George Gabriel Stokes (Bart.) (August 13, 1819- February 1, 1903), was an Irish mathematician who held Newton's chair at Cambridge from 1849 (the Lucasian Chair.) Stokes had an incredibly wide and prolific scientific career embracing mathematics, physics, physiology and ophthalmology. His studies began with fluid dynamics where he derived the fluid flow equation from principles of analytic mechanics. Unlike his predecessors, he substantially applied the theory to explaining a wide range of interesting natural phenomena. Naturally very generous with his time and skills, he helped many British scientists in the second half of the nineteenth century while claiming no credit from the results these collaborations gave rise to.

9 About Lloyd Tevis Investments

Lloyd Tevis Investments LLC is a registered investment adviser offering its services over the internet to US individual investors and their families. Our Precision Investing[™] service provides clients with highly personalized investment solutions tuned to the client's specific circumstances and objectives. We believe the strategic asset allocation decision is the key decision faced by our investors. Accordingly, our monthly commentary focuses on matters which can shape the longer term performance of

asset classes. We do not time market swings or pick individual stocks. Discussion at this level of detail is made for the light which it throws on relative valuations and such discussion should not be read as an investment recommendation. Indeed, our investment focus is on maximizing diversification, careful risk budgeting and maximizing implementation efficiency. These are the proven builders of long term investment success.

In evaluating political and social developments our perspective is that of long term investors. We believe the investor's interest is best served by a stable environment in which change occurs incrementally as broadly supported policies rather than by an environment of abrupt changes and frequent U-turns driven by transient partisan advantages. Finally, our assessments should always be read as what we consider likely to occur and not as expressions of what we would like to see come about. To learn more about our firm visit us at lloydtevis.com.