Funding the Future

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This post continues the story of quantum economics, which began here. That post provides important background information on how this series developed and was drafted. There is a summary of posts to date at the end of this post.

Money as Particle and Flow

“Light behaves as a particle. Light behaves as a wave. But light is neither. Light is what it is.” – Albert Einstein (paraphrased)

Physics has long wrestled with the question of what light really is. At times, it looks like a stream of particles, photons, each carrying a discrete quantum of energy. At other times it looks like a wave, spreading out, diffracting, and interfering. Which is it? The answer is unsettling, because it is both. Or, more precisely, it is neither until we choose how to observe it. The particle–wave duality is not a flaw of physics but a property of reality itself.

Money shares this duality. Sometimes it behaves as a discrete thing: a £10 note, a £100 transfer, a specific bank balance. At other times, it behaves as a flow, rippling through the economy, multiplying its effects, circulating in ways that matter more than its discrete origin. Economists and accountants, each in their way, have seen one side and not the other. The truth is that money is both, and recognising this changes how we think about the economy.

First: money as a particle

When we hold a coin or a note, money seems indivisible. A £10 note is not £9.999 recurring; it is exactly £10. You can break it into two fives or ten ones, but until you do so, it remains whole.

The same is true in a bank account. A debit of £100 is a precise entry. The books do not allow half an entry. Double-entry accounting, which underpins all financial record-keeping, insists on discrete units. Transactions are counted in whole quanta.

This particle-like quality of money is vital. It makes accounting possible. It means contracts can be enforced. It means debts can be settled precisely. It is the foundation of taxation, budgeting, and auditing. Without this discreteness, there could be no trust in financial systems.

The problem is that economists, too, often fall back on this particle view when talking about "units of account." They treat money as a thing, like a brick or a coin, moving around an economy in a predictable fashion. This, however, is only one view of money.

Second: money as a wave

Consider what happens when you spend that £10. Even in a decidedly simplified worldview:

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You buy bread.

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The shop pays the baker.

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The baker pays the miller.

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The miller pays the farmer.

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The farmer pays the worker.

The £10 ripples outward, generating effects far larger than its original size. This is the multiplier effect, taught in every economics textbook. One unit of money, moving through many hands, creates more than one unit of output.

This is wave behaviour. The £10 is not just a particle handed from one person to another. It is a wave propagating through the economy, setting off chains of transactions, amplifying as it goes.

Economists capture this when they talk of the "velocity of money." If money circulates quickly, it has more effect, just as a wave spreads further if the medium allows. If money is hoarded, the wave dies out, just as sound fades in a vacuum.

This flow aspect of money is harder to pin down than its particle nature. It is not about discrete entries but about patterns, cycles, and circulation. It is what makes macroeconomics, in particular, distinct from accounting.

Third: why the duality matters

It would be tempting to say that money is "sometimes" a particle and "sometimes" a wave, depending on how we look at it. But the lesson from physics is sharper: money is both, and we must hold both together.

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For the accountant, the particle view is essential. Debits and credits must balance. Transactions must be recorded in discrete amounts. Without this, trust collapses.

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For the economist, the wave view is indispensable. Aggregate flows, multipliers, and circulation matter more than any one discrete entry. Without this, policy collapses.

The problem is that too often the two communities talk past each other. Accountants insist on balance sheets; economists insist on flows. Neither is wrong, but neither is complete. Money is both a particle and a wave.

Fourth: policy implications

This duality has profound policy implications.

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Austerity ignores the wave. When governments cut spending to "balance the books," they focus on the particle view — debits and credits. But they ignore the wave view: that cutting £1 of spending can remove £2 or £3 of output once multipliers are considered. The particle may be balanced, but the wave collapses.

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QE ignores the particle. When central banks pump reserves into banks, they hope to stimulate flows. But if those reserves stay trapped in balance sheets, the particle view dominates: entries change, but no wave propagates. The policy fails.

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Tax myths exploit the confusion. Those who say "tax funds spending" rely on the particle metaphor — each pound in must match each pound out. But in reality, government spending creates flows that expand the economy, while taxation withdraws

waves of spending power. The causality is wave-first, not particle-first.

Understanding money's duality prevents us from being trapped in either fallacy.

Fifth: the multiplier as interference

Waves interfere. Drop two stones in a pond, and the ripples overlap, amplifying or cancelling each other.

The same is true in economics. When money flows overlap, they create interference patterns. Two government programmes may amplify each other: investment in schools and healthcare may both boost productivity more than either would alone. Conversely, tax cuts for the wealthy may cancel the intended effects of public spending by encouraging hoarding. I call these spillover effects in my work on tax.

This is why simplistic particle arithmetic fails. £10 of government spending is not just £10. It is a ripple in a complex wave field, amplifying and cancelling with other ripples. Policy cannot be judged by particle sums alone.

Sixth: hoarding as damping

In physics, waves can be damped by friction or resistance. In economics, waves are damped by hoarding.

When money is saved and not spent, it is taken out of circulation. The ripple fades. The velocity slows. The multiplier shrinks.

This is why inequality is so damaging. When wealth is concentrated, more money is hoarded. The rich save disproportionately. Their savings do not circulate into the real economy. The result is damped waves: lower growth, weaker demand, higher instability.

If we thought of money only as particles, we would not see this. But as waves, it becomes obvious: hoarding kills the flow.

Seventh: finance as standing waves

Speculation is another wave phenomenon. In physics, standing waves occur

when energy bounces back and forth, trapped in resonance. They can be beautiful, but they can also be destructive.

In finance, speculation traps money in loops of buying and selling assets. Prices oscillate, but little real output is created. This is a standing wave: energy contained, but not released productively.

It can build to destructive resonance. Just as bridges collapse when vibrations reach a critical frequency, financial markets collapse when speculation reaches unsustainable levels. The crash of 2008 was not an accident but the collapse of such resonance.

Eighth: rethinking monetary policy

A quantum-informed monetary policy would look different.

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It would not obsess over particles — the size of deficits, the levels of reserves.

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It would not pretend that flows can be precisely forecast.

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It would focus instead on how spending waves propagate through the system.

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It would target damping mechanisms: inequality, speculation, and hoarding.

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It would design spending to generate constructive interference: investments that amplify each other.

Such a policy would be more realistic because it would respect the dual nature of money.

Ninth: an economy as a quantum field

In the end, the analogy goes deeper. Physics now thinks of particles and waves as excitations in a quantum field. Particles are quanta of energy in a deeper medium.

The economy can be seen the same way. Money is both particle and wave, but beneath both is the field of social relations: labour, land, trust, and institutions. Money excites this field, creating ripples of activity. Without the field, there is nothing.

This helps us see why money is not wealth in itself. It is potential energy. Its real effects depend on the field it moves through — the capacities of labour, the availability of land, and the trust of society. Treating money as if it were wealth confuses the particle with the field.

These issues will be explored further in future posts.

Conclusion

Money is not a thing. Nor is it just a flow. It is both, and more. It is the dual reality of particle and wave, discrete and continuous, entry and ripple.

This duality explains why austerity fails, why inequality damages, why speculation destabilises, and why policy must focus not only on balancing the books but on sustaining the flows.

Economics that ignores this duality is blind. An economics that embraces it can begin to see reality.

Only when we treat money as both particle and flow can we design policies that fund the future.

Previous posts in this series

* ***Discussing quantum economics, accounting, money and more***
* ***Quantum economics, part 1: Why Quantum Thinking Matters for Economics***

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