The Sumner-Hanson Quartet

A prediction market + policy rule, for a countercyclical FED that always hits its targets, because speculators compete to be the first to profit off of the FED's policy failures.

Paul Sztorc

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Abstract

   If the FED has "targets" (for inflation, unemployment, etc), and a way to influence them via policy, *AND* infinite money-creating abilities, it should be able to hit those targets exactly, with the help of a prediction market.

Contents

   First, a simple macro model.
   Second, a 2x2 prediction market with a policy-axis and an objective function-axis. nGDP targeting is used as an example. The FED can hit their future nGDP target **exactly**.

   In fact, the FED can use this technique to exactly-hit *any* target they like (unemployment, inflation, etc) provided it is measurable.

   The "transmission mechanism" by which monetary policy affects the target, does not need to be known! Not does it need to be stable. It just needs to exist.

Previous Work

https://www.mercatus.org/system/files/Sumner_NGDPTargeting_v2.pdf
https://www.themoneyillusion.com/robin-hanson-on-prediction-markets/
http://www.overcomingbias.com/2008/07/intrades-condit.html

Description

We present an nGDP-derivative whose payoff *controls for* monetary policy.

The scheme emphasizes incentive-compatibility. Shrewd nGDP-speculators can ensure themselves a profit, *regardless of*:
* whether the FED follows this market's advice
* whether or not the FED-response to downward nGDP shocks is cancelled out by monetary policy, and even
* whether or not there is any relationship at all between nGDP and monetary policy.
Traders can specialize -- they can forecast nGDP, the money supply, the relationship between the two, or all three at once.

This proposal integrates Sumner's work with insights from Hanson/Finney (2008). The new market easily solves the "Circularity" and "First-Mover" problems. Second, the market does not itself administer policy (so it could theoretically be private, and run without the FED's consent). It runs in realtime, but can arbitrarily delay settlement, and is therefore robust to Data Revisions. Liquidity is provided by automated market maker, with bounded loss (unlike Sumner's markets, in which the FED must buy and sell unlimited quantities of futures) -- traders can always earn money by improving the forecast accuracy, even if they are the only trader. Short positions do not require margin accounts.

As a bonus, traders can hedge against changes in either nGDP or the Money Supply. These hedges do not bias our forecasts (ie, the prices of this market) -- unlike their counterparts in Sumner's markets, which do. This "bonus" is of tremendous independent value, as it allows traders to profit off of recessionary-events, in a way *other* than by hoarding cash. Thus, people no longer need to use cash as "recession insurance" (they can instead use it only for payment-making).

In fact, the debate between "hard money" and "stable money" is effectively ended by this proposal. Here, both types peacefully co-exist, and citizens can own as much of either as they want.

Assumptions: Macro Model

For simplicity, I assume:

Simple New Keynesian / Monetarist macro-economy:
* Recessions are caused by a sudden transitory desire to hoard cash ("tight money" / "sticky prices" / "animal spirits").
* Recessions can be cured by supplying money -- this stimulates nominal spending and thus nominal income,
    which at the "stuck" prices restarts rGDP. Restoring GDP to "potential".
* It is better to "socialize" the cost of the recession, via inflation tax, than to allow depression to concentrate
    its firepower on individual people, (as this might cause a cascade of defaults, unemployment,
    etc and thus damage the interconnected economy).
* However, it is bad to increase M too much (ie, when rGDP is at or near potential). Inflation by itself is undesirable.
    Animal spirits recover quickly, and M may need to decrease!

The FED is capable of printing any amount of money, and injecting this into the economy.
* First, by buying/lending against assets, in a big sequence: from best collateral [T-bills] to worst [junk bonds, etc].
* Second by just helicopter dropping.

(But believe it or not, the macro model doesn't matter here.
    If there is *any* possible way that monetary policy can affect the objective function, then this idea will work.)

Assumptions: Market Features

I will create a 2-dimensional LMSR prediction market with the following simplifying assumptions:

No frictions (infinite liquidity, anonymous trading, no laws against gambling, no income taxes, etc).
No oracle problems (we can always measure the underlying perfectly, it is reported publicly, etc).
* Specifically, we are measuring: [1] quantity of high-powermoney; [2] nominal GDP; in a given year.

(Remember: The example below uses nGDP, but this idea is not limited to it. You can instead target the unemployment rate,
    industrial production, S&P 500 price -- anything that is post-hoc measurable.)

Example Market

There are two underlying metrics:
* nGDP: our derivative will map the values [$0.00, $1.00] to the year-2020 nGDP values [$15 trillion , $25 trillion].
* M (highpower money): our derivative will map [$0, $1] to the average money supply during 2020 [2 trillion to 4 trillion].

Furthermore:
* In each contract, traders can go long or short -- buying "Max" is going long, buying "min" is going short.
* The contracts are arranged into a single 2-dimensional market -- a 4x4 grid.
* Thus, there are four contracts total. Their prices must sum to 1.
* For more information on LMSR markets (specifically, how prices are determined by shares outstanding),
    see http://bitcoinhivemind.com/papers/LogMSR_Demo.xlsx .

Initial Conditions

		nGDP		
		min	Max	
M	min	0.07	0.57	0.64
	Max	0.20	0.16	0.36
		0.27	0.73	

current nGDP estimate: $23.68
current M estimate: $3.39

nGDP (t US$)		M (t US$)	
min	12	min	2.2
Max	28	Max	5.5
span	16	span	3.3
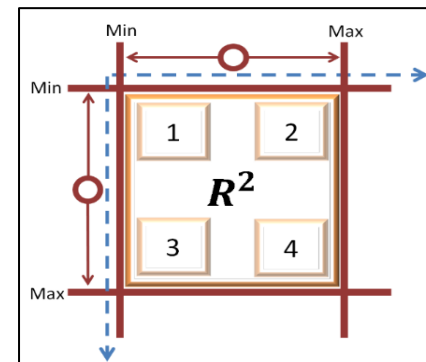
For an explanation of this figure,
see document #2 in the PM Sequence.

Above: Market with sample prices. Since it is a prediction market, all prices are also forecasts:
* The market believes nGDP will make it 73%-way through the 16 trillion dollar span between the parameters 12 and 28 trillion.
* And it believes M will make it 36%-way through the 3.3 trillion dollar span separating the parameters 2.2 trillion and 5.5 trillion.

And let us assume that we start on-target. nGDP starts at 23.68 trillion; M starts at 3.39 trillion:

nGDP target = $23.68   nGDP estimate= $23.68
M (at time=0) = $3.39   M estimate= $3.39

We are clearly in equilibrium….

Now, a shock to nGDP.

Animal spirits attack, leading people to become worried about the future, and hoard a LOT more cash.

nGDP $23.68   ---> $22.10

nGDP min is still priced at 0.27 (wrongly expecting $T 23.68).
        So arbitrageurs buy it until it is …

min*	Max*		delta	delta/2
0.37	0.63		0.10	0.04937

		nGDP		
		min	Max	
M	min	0.12	0.52	0.64
	Max	0.25	0.11	0.36
		0.37	0.63	

        current nGDP estimate: $22.10
        current M estimate: $3.39

Above: market prices after the nGDP shock.

Everyone now knows that nGDP is estimated to be … $22.10

      …which is   93.33% of target.

      … implying that M should increase by   1.07149 …

      …ie, from $3.39   to $3.63 .

So….

…the FED increases M.

For simplicity, lets just assume that the FED nails it on the first try, and increases M by the exact perfect amount.

In reality, this would probably never happen, but **this scheme here is a live market**.

      * It will provide ongoing advice (constant error-correction). So, FED can keep trying all day until it gets it exactly right.

Now, M Max is the one that is under priced. It priced at 0.36 (wrongly expecting $T 3.39).

      So arbitrageurs buy it until it is …

Max*		delta	delta/2
0.43		0.07	0.0367

		nGDP		
		min	Max	
M	min	0.08	0.48	0.57
	Max	0.29	0.15	0.43
		0.37	0.63	

current nGDP estimate: $22.10

current M estimate: $3.63

Above: market prices immediately after the FED adds money to the economy.

…the new M, raises nGDP.

M is up, more cash in the economy -- nominal GDP must rise.
Again, to avoid extra steps, I assume it is now expected to hit the target, $23.68 .

Arbitrageurs now expect nGDP Max to go back to where it was,   0.73 .

	delta	delta/2
	0.10	0.04937

		nGDP		
		min	Max	
M	min	0.03	0.53	0.57
	Max	0.24	0.20	0.43
		0.27	0.73	

current nGDP estimate: $23.68

current M estimate: $3.63

Above: market prices in the future (say, April 2021), after someone has had the opportunity to tally up
          what GDP and M actually were in the year 2020.

We can see that the recession/depression was averted.

Incentive Compatibility

At each stage, arbitrageurs are just taking free money via zero-profit conditions.

The FED learns from these prices what nGDP will be. This is the most reliable information availiable.

The magic square is the bottom left one.

It has a positive return (in response to unexpected downward nGDP-shocks) regardless of what the FED does.

This solves a crucial chicken-and-egg problem: how to get traders to bet that nGDP will fall,

if by doing so they would actually cause it to re-rise (by causing the FED to notice and take action).

Ordinarily, if these traders were right about nGDP falling, then they end up losing!

This market is special -- here, traders can respond to the real-world nGDP shock, by buying the lower-left unit.

That buy is a bet saying: "I bet that nGDP will decrease, and that the FED loosens".

They make two bets at once, one of which they must win.

Cell M41 shows that traders will make a return of +18.35%, if nGDP is ultimately constant as a result of FED intervention.

(Optionally, traders take on additional risk, and speculate on the FED response --

-- appropriately looser [lower right] or disastrously tighter [upper left].)

Below (overleaf) is the whole picture at once.

Cells H43:I44 show the prices that traders are stuck with, if the FED responds to the shock by doing nothing.

(Ie, if the FED never actually eases.)

	Prices		Returns

Prices | **Returns**

I will restate the prices at each state… | …and calculate the ROIs of owning a unit of each state.

At onset,
(but before the nGDP shock):

	min	Max
min	0.07	0.57
Max	0.20	0.16

	min	Max
min	-52.43%	-6.44%
Max	18.35%	22.94%

After the nGDP shock,
(but before FED easing):

	min	Max
min	0.12	0.52
Max	0.25	0.11

	min	Max
min	-72.10%	2.43%
Max	-5.08%	77.81%

After the FED easing,
(but before nGDP adjusts):

	min	Max
min	0.08	0.48
Max	0.29	0.15

	min	Max
min	-59.72%	10.20%
Max	-17.26%	33.51%

After nGDP adjusts:
(Final Prices)

	min	Max
min	0.03	0.53
Max	0.24	0.20

	min	Max
min	0.00%	0.00%
Max	0.00%	0.00%

If some a genius-trader foresaw BOTH [1] the nGDP downward shock, and [2] the FED's accomodative response, then then these are the returns they could achieve.

Obviously, they would buy the two lowermost assets, especially the lower-right asset (yielding +22.94%)

If a different genius-trader foresaw BOTH [1] the nGDP downward shock, and they also correctly predicted [2] that the Fed would fail give enough accomodation (or fail to give the right type, or whatever).

Obviously, they would buy the two leftmost assets, especially the upper-left asset (yielding +70.54%)

70.54%	-8.66%
24.69%	-30.86%

24.69%   TRUE
18.35%   TRUE

THE POINT: the contract in the lower left, makes money either way.

How?

Well…

* This example supposed that the economy hit a negative shock. Negative shock = good for "left" shares.

* Our macro model assumed that the ONLY way to restore nGDP, was for M to increase. Higher M = good for "lower" shares.

The "lower-left" share is in both of those share-groups -- so, once the shock hits, it can't lose.

In the real world, the trader can lose (or, at least, be forced to breakeven), if:

* it were NOT true that "the economy hit a negative shock". Then the trader will lose greatly.

* nGDP returns to target all on its own, or in some way that does NOT involve an increase in M. Then the trader loses slightly.

In the first case, the trader made a forecasting error. In the second case, the macroeconomic model was falsified.

Pure Inflation Hedge

As a bonus, traders have on-demand access to an asset whose price co-varies with increases in money supply.

All they need to do is bet on an increase in M, by buying the lower two states simultaneously.

Such a portfolio, will gain value whenever M increases, and lose value whenever it decreases.

This asset is a nice complement to TIPS (Treasury Inflation-Protected Securities), which covary with CPI-inflation.

Pure Recession Hedge

As a second bonus, traders have on-demand access to a recession hedge -- notably, one that *isn't* cash.

All they need to do is bet on a decrease in nGDP, by buying the left two states simultaneously.

Such a portfolio, will gain value whenever nGDP decreases, and lose value whenever nGDP increases.

Some theorists believe that cash should NOT be used both for payments and simultaneously for "recession insurance".

Cost / Feasibility

The Board of the Federal Reserve (the seven people in charge, and their staff), spends $790,000,000+ a year.

https://www.federalreserve.gov/publications/2018-ar-federal-system-budgets.htm

https://en.wikipedia.org/wiki/Federal_Reserve_Board_of_Governors

The Great Recession (2008) is estimated to have cost at least $1-10 trillion.

https://www.nytimes.com/2014/01/22/business/economy/the-cost-of-the-financial-crisis-is-still-being-tallied.html

This project would cost, at most, $1 million to administer and $5 million to subsidize handsomely.

Further Reading

https://www.themoneyillusion.com/are-we-too-cheap-to-test-macro-theories-or-afraid-of-the-answers-wed-get/