

By Jim Forsythe

@JImForsythe5 on twitter - see my pinned tweet for a referral code to Citizens for Sound Money, a non-profit to encourage the use of sound money, and protect people's right to do so.

WARNING:

- All the analysis I provide is based on my understanding, and is not official. I do not work for Kinesis. I will correct any errors pointed out to me. I have been wrong before, plenty of times.
- This document assumes a basic familiarity of the Kinesis system, see <https://kinesis.money> before wasting time reading this.
- This is for advanced users wanting a deeper understanding
- If you don't like math, focus on the highlighted portions

Motivation and Background

- Provide an alternative explanation of the Kinesis yields vs. https://kinesis.money/resources/Kinesis_Yields_Infographics.pdf
 - I believe the above document is trying to present a simple view of the yields, but has added to the confusion
 - "Total metal in the system" is not the right thing to show up in the denominator. I have talked to support about this, and they seem to agree and should be working on fixing it.
- Also provide some thoughts about the dynamics of the system. I.e. the incentives that will be created by the different yields
 - The dynamics won't be known until the yields begin to be published
 - Yields are being calculated, and will be applied retroactively
 - Yield payments planned for Q2 2021
- My background: Among other things, I have been an Aerospace Professor for years.
 - *Apologize if the explanation involves too much math*, but I believe over-simplifying the math creates more confusion.
- I believe the yield system to be incredibly ingenious and is the first of its kind.

Definitions and Symbols

<i>KAU</i>	The crypto token for vaulted gold, backed 1:1. 1 KAU = 1g Gold
<i>KAG</i>	The crypto token for vaulted silver, backed 1:1. 1 KAG = 1 Oz Silver

FP	The fee pool in any given period. The sum of all fees from exchanges, minting, transfers, etc. Subscripts for the fees of specific tokens, superscripts for the period (d=day, m=month, y=year)
KAU, KAG	When used as subscripts, indicates the applicable amounts of KAU/KAG
u	A given user, will be used as superscripts on other values
$MINT$	The totals minted in KAU or KAG up to the current month.
$3x, 1x$	Mint multiplier during PMO (3x) or after (1x), May be used as subscripts for the minting totals above
$HELD$	The amount of KAU/KAG held either on the exchange (KMS) or in a wallet tied to the KMS account in the given month
Y_H, Y_M	Monthly Holders or Minting yields, expressed in KAU or KAG
Y_P_H, Y_P_M	The percentage yield of minting or holding.
V	Velocity of transactions. Percent of metal in circulation that is sent, spent, minted or exchanged per day. I.e. subject to the 0.45% fee.
T_{KAU}, T_{KAG}	Transactions per day (sent, spent, or exchanged) in each metal
$CIRC$	The amount of KAU/KAG in circulation on a given day
MP	The percentage of cost to mint compared to the amount minted, due to minting fees, bid/ask spreads, transfer fees, and exchange fees
$REDEM$	Total amount of metal that has been redeemed. Either physically redeemed or taken out of circulation by market makers

What is minting?

When a user “mints” they essentially buy gold/silver from the bullion exchange, and it gets added to the vault, and they receive the corresponding KAU/KAG tokens. 100g increments for KAU, 200 Oz increments for KAG.

Currently there is a public minting offer (PMO). <https://kinesis.money/pmo-bonus-terms/>. While the offer is open, minters receive 3x the normal credit for tokens minted.

Equations/Summaries will be for KAU, but apply the same for KAG

Fee pool

The fee pool increase on any given day is simply:

$$FP_{KAU}^d = 0.0045 \cdot T_{KAU}$$

In order to relate this to velocity (transactions per day per metal in circulation)

$$FP_{KAU}^d = 0.0045 \frac{T_{KAU}}{CIRC_{KAU}} CIRC_{KAU} = 0.0045 \cdot V \cdot CIRC_{KAU}$$

Note, that the metal in circulation does not actually directly affect the fee pool, it's transactions that matter. However this approach is taken to relate the analysis back to the tables of velocity in the blueprint.

To annualize the fee pool, simply multiply by 365.25:

$$FP_{KAU}^y = 365.25 \cdot 0.0045 \cdot V \cdot CIRC_{KAU} = 1.643625 \cdot V \cdot CIRC_{KAU}$$

Or as a ratio to be used later:

$$\frac{FP_{KAU}^y}{CIRC_{KAU}} = 1.643625 \cdot V$$

In summary:

- Velocity is the percent of tokens in circulation that are sent, spent, etc on a given day (i.e. a 0.45% transaction fee is incurred)
- The annualized size of the fee pool as a fraction of tokens in circulation is 1.643625 times the velocity

Holder's yield

For a given user:

In math:

$$Y_{H,KAU}^u = 0.15 \cdot FP_{KAU} \frac{HELD_{KAU}^u}{\sum_{u=all} HELD_{KAU}^u}$$

In words:

The yield in KAU for a given user in a given month is equal to 15% of the fee pool from KAU for that month, multiplied by the amount of KAU held, divided by the total KAU held by all users.

In terms of percentage yields, based on the the amount held, just divide by the user's held amount.:

In math:

$$YP_{H,KAU}^u = \frac{Y_{H,KAU}^u}{HELD_{KAU}^u} = \frac{0.15 \cdot FP_{KAU}}{\sum_{u=all} HELD_{KAU}^u}$$

Minter's yield

For a given user:

In math:

$$Y_{M,KAU}^u = 0.05 FP_{KAU} \frac{3 \cdot MINT_{3x,KAU}^u + MINT_{1x,KAU}^u}{\sum_{u=all} (3 \cdot MINT_{3x,KAU}^u + MINT_{1x,KAU}^u)}$$

In words:

The yield in KAU for a given user in a given month is equal to 5% of the fee pool from KAU for that month, multiplied by the total amount of mint credits in KAU, divided by the total amount of mint credits of all users. Mint credits are 3x the amount minted AND then exchanged during the PMO, and 1x the amount minted and then exchanged after the PMO ends.

Relationship to Velocity and Blueprint

Holder's yield

If you make the assumption that all the metal that is held is the same as what is in circulation, and substitute the fee pool relationship with velocity, the annualized holder's yield in percentage terms becomes,

$$YP_{H,KAU}^{u,y} = \frac{0.15 \cdot FP_{KAU}^y}{CIRC_{KAU}} = 0.15 \cdot 1.643625 \cdot V = 0.2465 \cdot V$$

This matches the kinesis blueprint (<https://kinesis.money/resources/kinesis-blueprint-en.pdf>, page 36), e.g. at 10% velocity, the above equation gives 0.02465, i.e. 2.46% (rounded down), the same as the blueprint.

So the annualized holders yield is equal to 24.65% times the velocity, e.g. at 10% velocity, the yield would be 2.465%.

Minting Yield

While the PMO is in effect, all minters receive 3x credit, so the yield is:

$$Y_{M,KAU}^u = 0.05 FP_{KAU} \frac{3 \cdot MINT_{3x,KAU}^u}{\sum_{u=all} 3 \cdot MINT_{3x,KAU}^u} = 0.05 FP_{KAU} \frac{MINT_{3x,KAU}^u}{\sum_{u=all} MINT_{3x,KAU}^u}$$

I.e. since everyone gets 3x credit towards the 5% of the fee pool, no one is at an advantage, and the 3x multiplier cancels out.

And if it is assumed that the sum of everything minted is equal to the KAU in circulation (something that is not true because of redemptions)

$$Y_{M,KAU}^u = 0.05 \cdot FP_{KAU} \frac{MINT_{3x,KAU}^u}{CIRC_{KAU}}$$

In percentage terms based on the amount minted, and substituting the velocity ratio and annualizing:

$$YP_{M,KAU}^u = \frac{Y_{M,KAU}^u}{MINT_{3x,KAU}^u} = 0.05 \frac{FP_{KAU}}{CIRC_{KAU}} = 0.05 \cdot 1.64325 \cdot V = 0.082 \cdot V$$

So while the PMO is active, and assuming no redemptions, the annualized minter's yield (based on the amount minted) would be 8.2% times the velocity, e.g. 0.82% if velocity is 10%.

This again checks against the data in the blueprint, a 10% velocity gives a 0.82% yield as seen on page 33.

However, at the end of minting, you still have the KAU and earn holder's yield. To split the benefits of minting vs. holding, I think it is more useful to look at the yield in terms of the minting costs (MC).

$$YP_{MC,KAU}^u = \frac{YP_{MC,KAU}^u}{MC_{KAU}} = \frac{0.082}{MC_{KAU}} \cdot V$$

I have minted KAU for as low as 1%, and KAG for as low as 2%. However, my average for KAU is closer to 1.5%, and for KAG as high as 5%. With a velocity of 10%, and a minting cost of 1.5%, the above formula gives a yield of 55%, i.e. at that velocity you regain over half the cost of minting in a year. Higher velocities would pay back earlier.

In summary, the minting yield expressed instead based on the expense of minting would be 8.2% times the velocity, divided by the cost of minting per value minted. E.g. at 1.5% cost per mint cycle, and a velocity of 10%, the yield is $8.2\% \cdot 0.1 / 0.015 = 55\%$.

Effect of Redemptions

The blueprint numbers seem to be based on no redemptions. However physical redemptions or KAG/KAU held by market makers and taken out of circulation can change the calculations. To account for this effect we first assume that metal held and in circulation is synonymous. In this case, we expect:

$$CIRC_{KAU} = MINT_{KAU} - REDEM_{KAU}$$

Holder's yield

In this case the holder's yield does not change:

$$YP_{H,KAU}^{u,y} = 0.2465 \cdot V$$

However remember that velocity is given by transactions per day per KAU in circulation:

$$V = \frac{T_{KAU}}{CIRC_{KAU}}$$

Substituting in the relationship between minting and redemption:

$$YP_{H,KAU}^{u,y} = 0.2465 \frac{T_{KAU}}{MINT_{KAU} - REDEM_{KAU}}$$

So assuming fixed transactions minting drives down the holder's yield, while redemptions drive up the holder's yield.

So the effect of redemptions on the holder's yield assuming fixed transactions per day is to increase the holder's yield.

This is the part of the math behind reversing Gresham's law! If people redeem and hoard physical, then the holder's yield will go up, encouraging them to keep the physical in the system!

Minting yield

To analyze minting yields with redemptions, we have to go back to the equation before making the assumption that all minted tokens remain in circulation

$$Y_{M,KAU}^u = 0.05 FP_{KAU} \frac{3 \cdot MINT_{3x,KAU}^u + MINT_{1x,KAU}^u}{\sum_{u=all} (3 \cdot MINT_{3x,KAU}^u + MINT_{1x,KAU}^u)}$$

Substituting the annualized fee pool in terms of velocity:

$$Y_{M,KAU}^{u,y} = 0.05 \cdot 1.643625 \cdot V \cdot CIRC_{KAU} \frac{3 \cdot MINT_{3x,KAU}^u + MINT_{1x,KAU}^u}{\sum_{u=all} (3 \cdot MINT_{3x,KAU}^u + MINT_{1x,KAU}^u)}$$

Substituting the relationship between tokens minted, redeemed, and in circulation:

$$Y_{M,KAU}^{u,y} = 0.082 \cdot V \cdot (MINT_{KAU} - REDEM_{KAU}) \frac{3 \cdot MINT_{3x,KAU}^u + MINT_{1x,KAU}^u}{\sum_{u=all} (3 \cdot MINT_{3x,KAU}^u + MINT_{1x,KAU}^u)}$$

In the scenario where all minters have 3x credit, and understanding that the summation in the denominator is just the total amount minted:

$$Y_{M,KAU}^{u,y} = 0.082 \cdot V \cdot (MINT_{KAU} - REDEM_{KAU}) \frac{MINT_{3x,KAU}^u}{MINT_{KAU}}$$

Simplifying

$$Y_{M,KAU}^{u,y} = 0.082 \cdot V \cdot (1 - \frac{REDEM_{KAU}}{MINT_{KAU}}) MINT_{3x,KAU}^u$$

As the amount of redemptions approaches the total minted, the ratio in the parentheses goes to 1, and the yield approaches zero, assuming fixed velocity. Fortunately the holder's yield helps discourage this!

The next scenario is one where long after the PMO has ended, and minting is at 1x credit.

Once this new minting is far greater than the minting at 3x credit, the 3x credit term in the denominator goes down in relative terms and the total amount minted becomes close to the 1x tokens minted:

$$Y_{M,KAU}^{u,y} = 0.082 \cdot V \cdot (MINT_{KAU} - REDEM_{KAU}) \frac{3 \cdot MINT_{3x,KAU}^u + MINT_{1x,KAU}^u}{MINT_{1x,KAU}}$$

Simplifying

$$Y_{M,KAU}^{u,y} = 0.082 \cdot V \cdot (1 - \frac{REDEM_{KAU}}{MINT_{KAU}}) (3 \cdot MINT_{3x,KAU}^u + MINT_{1x,KAU}^u)$$

So the yields from the minted tokens during the 3x offer will approach 3x the yield of the newly minted tokens. However both yields are diminished as redemptions increase in terms of the totals minted. So while a 10% velocity would produce a 0.82% yield during the PMO, as more 1x minting occurs, the yield would approach 2.46%. However, both yields would decrease with increasing redemptions.

Another way to look at the denominator is to think of it in terms of the average minting credit (MC_{avg}).

$$MC_{avg} = \frac{\sum_{u=all} (3 \cdot MINT_{3x,KAU}^u + MINT_{1x,KAU}^u)}{\sum_{u=all} MINT_{KAU}}$$

I.e. the sum of all mint credits divided by the sum of all KAU minted. This ratio is 3x during the PMO and will move down towards 1x after the PMO is expired. In this case the equation becomes

$$Y_{M,KAU}^{u,y} = 0.082 \cdot V \cdot (MINT_{KAU} - REDEM_{KAU}) \frac{3 \cdot MINT_{3x,KAU}^u + MINT_{1x,KAU}^u}{MC_{avg} \cdot \sum_{u=all} MINT_{KAU}}$$

The average mint credit multiplier during the PMO is 3x, and will decline towards 1x after the PMO expires as more is minted at a 1x multiplier. This means currently PMO minters will only see 1x the yields of the “average” minter and non-PMO minters will see 1/3x of the average. Over time PMO minters will see 3x yields compared to the average, and non-PMO minters will see 1x the average. However, at all times PMO minters will see 3x yields compared to non-PMO minters.

Note, that the yield based on the minting cost is increased as minting cost is reduced. I.e. minting is encouraged when:

- The exchange bid is close to the minting cost
- The ratio of redemptions to minting is low
- The above two are however coupled:
 - More redemptions lead to less KAU in supply on the exchange, which would drive up the price on the exchange, which would encourage minting.
 - Also redemptions would be discouraged by the holders yield. This would also encourage physical holder to add physical back into the system, lowering the total redemptions

Key Conclusions:

- Holder’s yields provide a feedback mechanism to discourage redemptions, reversing Gresham’s law
- Holders may benefit dramatically from the fees incurred by current minting
- Current 3x minting yields are not expected to produce triple yields now, but will approach triple the yield of 1x minting that occurs later
- Redemptions will reduce the minting yield over time, however the holder’s yield helps provide an incentive to limit redemptions
- Redemptions would likely drive up the market price, encouraging minting

Relationship between spending and saving

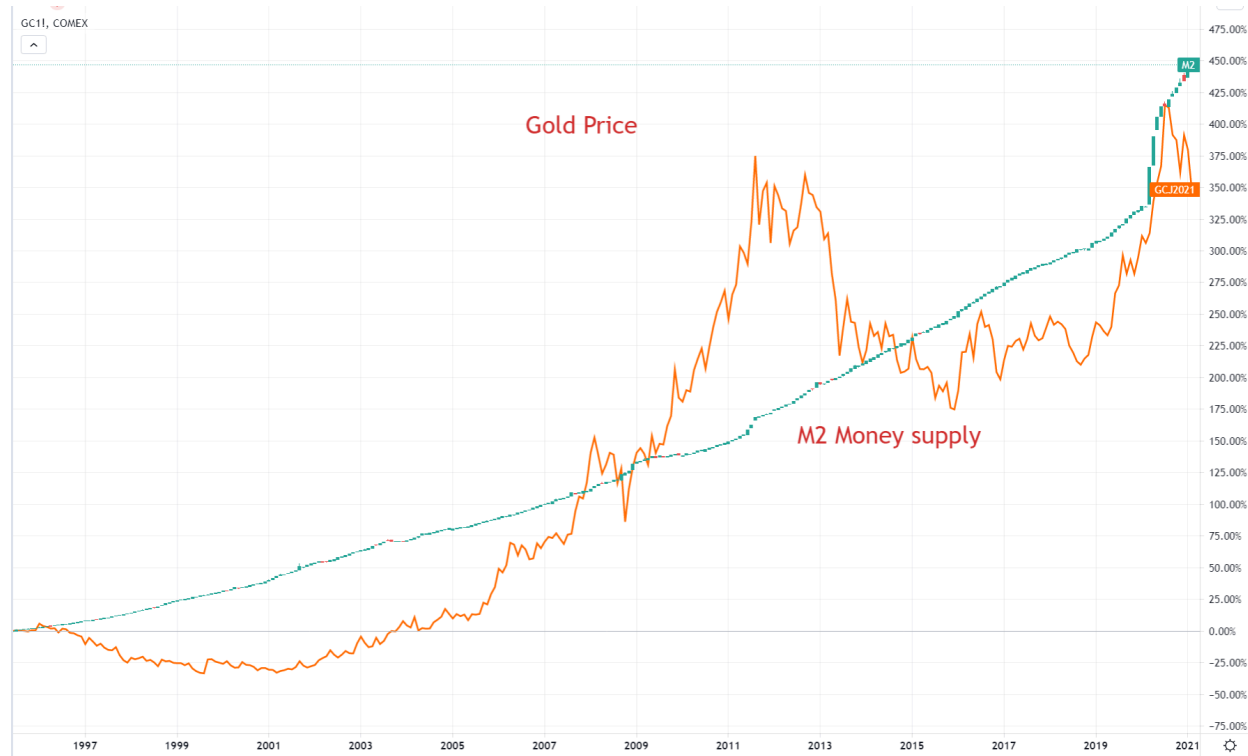
I believe that this new monetary system is revolutionary in the way that it provides feedback between spending vs. saving (i.e. holding). As background see the Austrian Economics Business cycle theory. https://en.wikipedia.org/wiki/Austrian_business_cycle_theory. But some basic components are:

- Prior to the Federal Reserve, interest rates were set by the market:
 - The assets (i.e. gold and silver) of savers were lent out to spenders (i.e. borrowers).
 - Since the borrowers often were borrowing to buy something (e.g. a house), the purchased item showed up on the banks balance sheet, allowing the money to be lent out again. Fractional reserve banking.
 - Interest rates set by the market - the more people that wanted to save, the lower interest rates would go, which would stimulate spending, and vice versa.
 - This market dynamic tied the desire for future consumption (i.e. savings are a desire for future vs. consumption) to borrowing for building things for the future
 - Example: If lots of people are saving up to buy houses, interest rates go down, home builders use these lower interest rates to build houses
 - Due to the fractional reserve nature of the system, there were boom/bust cycles but relatively minor by today's standards
 - E.G. housing prices go down and someone defaults on their mortgage, the bank sells it at a fraction of the loan value, lowering the bank assets, the original saver try to take their money (gold/silver) out, but there is no longer enough for them.
- After the Federal Reserve (Fed) was created
 - Fed creates artificial interest rates, typically lower than where the market would set them (to stimulate the economy)
 - These low interest rates, disconnected from market forces are seen as a desire for future spending. E.g. home builders build a bunch of new houses since interest rates are low. However, no one has been saving since interest rates are low, so there is no incentive to save.
 - First boom after creation was the roaring twenties
 - First bust was the great depression
 - These artificially low interest rates encourage borrowing and discourage saving.
 - As lender of last resort and a backstop to the banks, fractional reserve ratios dramatically expand, making the boom/bust cycles far worse than before.
 - Great Depression
 - 1987 Stock market crash
 - Dot-com bubble
 - Great financial crisis
 - Today's sovereign debt bubble
- Kinesis monetary system

- Savers (Holders) are able to earn a yield without any fractional reserves. I.e. KAU/KAG is 1:1 with physical, yet savers are able to earn a yield via transaction fees
 - This is made possible via the use of crypto tokens, and was not possible in the “old days”
 - This makes it a truly unique monetary system
- Incentives to save vs. spend are linked to provide feedback
 - As spending increases, velocity increases and therefore holder’s yields will increase, providing an incentive to save
 - As holdings increase relative to spending (i.e. velocity decreases), then holders yield will decrease. With a lower benefit of holding, there is more of an incentive to spend.
- This dynamic is different than the saving vs. lending dynamic analyzed by the Austrian Economists, my gut feel based on the math is:
 - It should provide the same kind of stabilizing influence that market interest rates did.
 - Because it does not depend on fractional lending, I think it will be even more stable than the pre-Fed days.

Gold price model

- Absent other factors, one would expect the dollar price of gold and silver to follow the growth in the money supply (M2), see figure below for a comparison of gold price vs. M2
 - Decreasing faith in the \$ and/or low interest rates cause gold to go above this trend and vice versa
 - I would argue we are currently heading towards decreased faith in the dollar, and certain towards low real interest rates (although interest rates have moved up recently, YCC is likely coming)



- Interest rates are very strongly correlated to gold price, high interest rates decrease gold price and vice versa. Probably for two reasons:
 - Gold has (until now) no yield, so high interest rates for bonds siphon funds from bonds
 - Since the futures market is highly leveraged, interest rates also impact the futures market
- So what happens when gold has a yield, via kinesis, and gold physical transactions increasingly drive gold price rather than futures markets? I would argue gold price would increasingly follow the growth of M2.
 - M2 grew around 25% in 2020. That has slowed, but growth rate is still high.
 - Currently M2 is growing at about 1% per month, so on average an increase in gold price of around 1% per month is expected

Using gold or silver as money

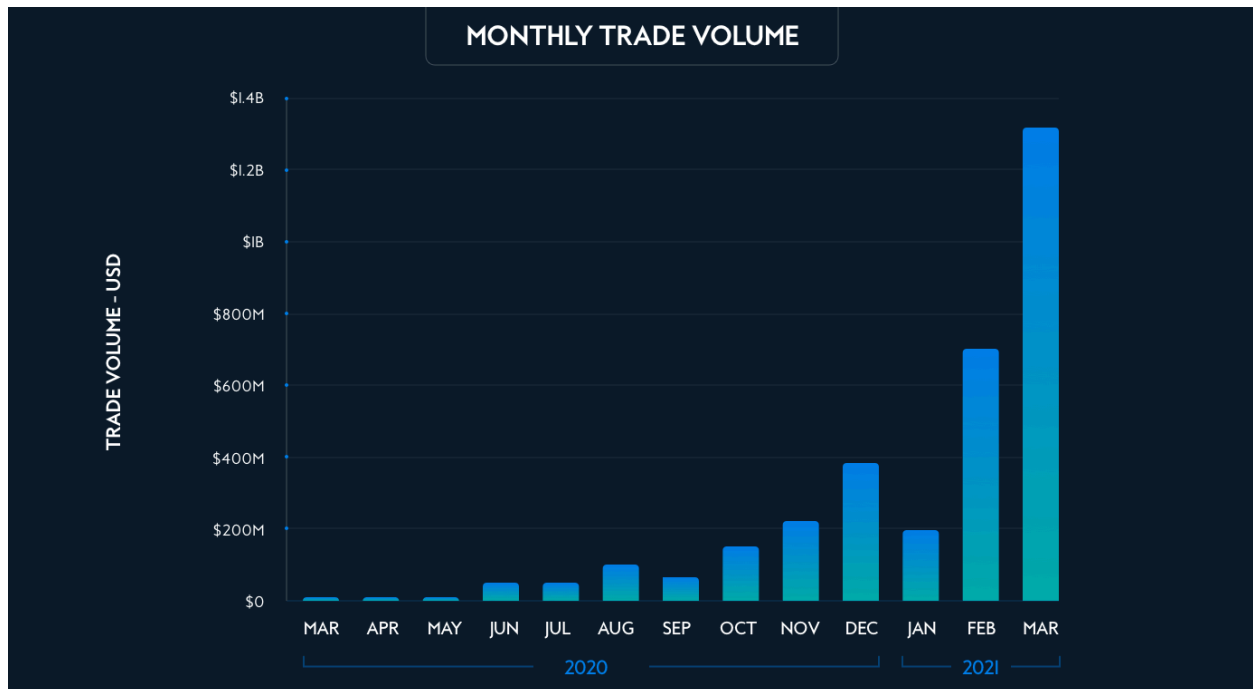
The key to this new system is the yields, and for yields to happen, aside from minting, users will need to send, spend, or exchange their KAU/KAG.

- Why would people spend their gold/silver rather than cash, i.e. \$s? They will if they are not holding any cash!!
- So would people want to put the bulk of their liquid savings into gold/silver?
- To incentivize this, the expected return from holding then spending gold/silver needs to be higher than holding cash.
 - Money markets, etc are near zero percent

- To buy, and then later sell incurs a 0.44% fee (0.22% for the buy, and again for the sale).
- If gold on average grows with M2 (see discussion above), then price would be expected to grow on average 1% per month.
- If the holders annualized yield is 2.46%, then it would be 0.2% per month
- Combined with M2 growth, this gives 1.2% per month.
- To break even with the 0.44% fees, the holding period (on average) would need to be around 1.5 weeks!
- This is on average, the current volatility, and sensitivity to interest rates makes this riskier, so longer holding periods would be required until this volatility is decreased (again, see above discussion).
- Periods of strong inflation and/or big gold price moves can dramatically reduce the holding period required to break even.
- **Conclusion: Using Kinesis for short term savings (1-2 months) seems very likely to make sense. Increasingly it may also make sense for day to day spending for expenses expected in the next week or two.**
- **Note, that buying then selling is two transactions, so the velocity of a deposit that is later spent would be $2/(\text{days held})$. Holding for 20 days would be a velocity of 10%.**

Q1 Report Yield Analysis

The Q1 report (<https://kinesis.money/company-news/q1-ceo-quarterly-update-2021/>) had a plot of volume that was all-inclusive.



What does the \$1.3B volume mean for yields? Note that this volume includes mint volume.

Fee Pool:

The maximum fee for any transaction is 0.45%. Exchanges between two parties are 0.22% for each party, close to 0.45%. So the maximum the fee pool could be:

$$\$1,300,000,000 \cdot 0.045\% = \$5,850,000$$

However, if the bulk of the transactions were due to minting because of the PMO, then each mint cycle would consist of the minting transaction (at 0.45%), and a sale on the exchange (0.22%). If the sale on the exchange was to the market maker, then there would be no corresponding 0.22% fee from a buyer. The lowest fees would be if half of the volume was minting, and the other half the subsequent exchange to the market maker.

$$\left(\frac{1}{2} \cdot 0.45\% + \frac{1}{2} \cdot 0.22\%\right) \cdot \$1,300,000,000 = 0.335\% \cdot \$1,300,000,000 = \$4,355,000$$

KAU Holders yield

A rough chart/table of KAU/KAG in circulation can be seen here, there is another tab for possible yields.

<https://docs.google.com/spreadsheets/d/1ohR24ondLBd-968po2OA19N-AzVml7BvYb3vi2b-jbs/edit?usp=sharing>