

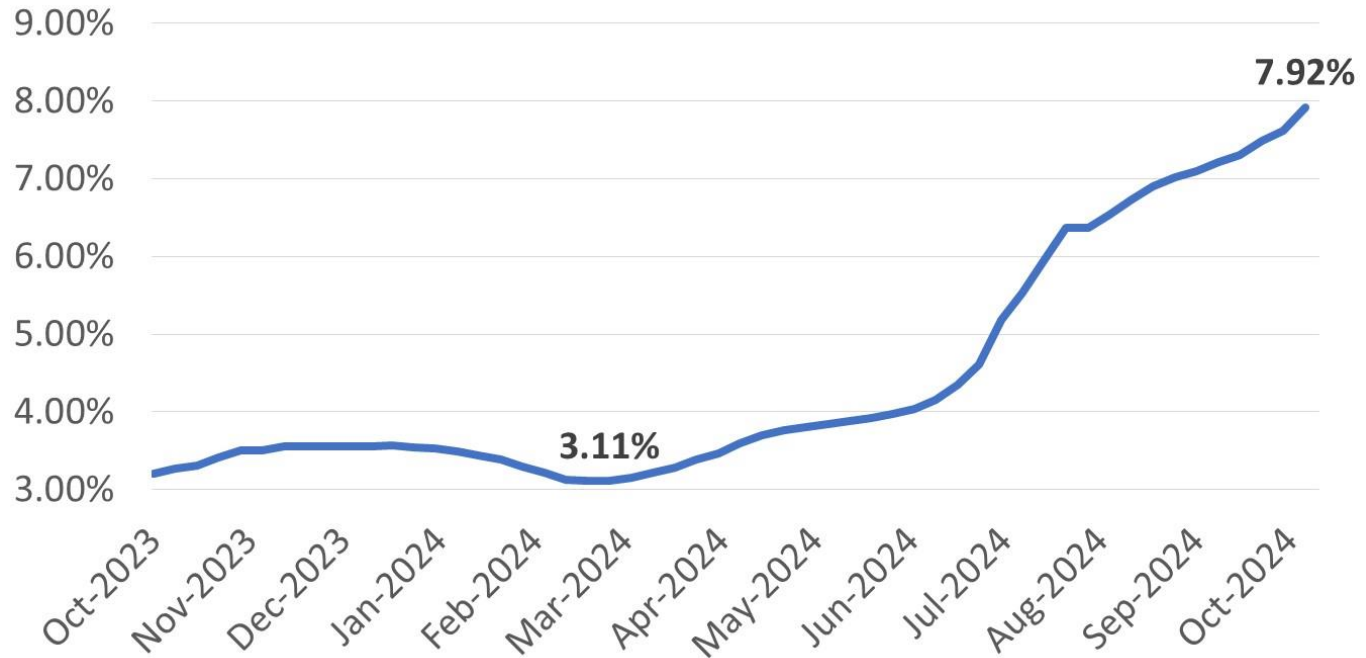
Investor Notes – 18 October 2024

- **Continued stress in PNG Fixed Interest Markets**
- **Treasury Bill Yields have continued to rise sharply – increasing 4.81% since March 2024.**
- **Volumes are patchy in both Treasuries and GIS markets**

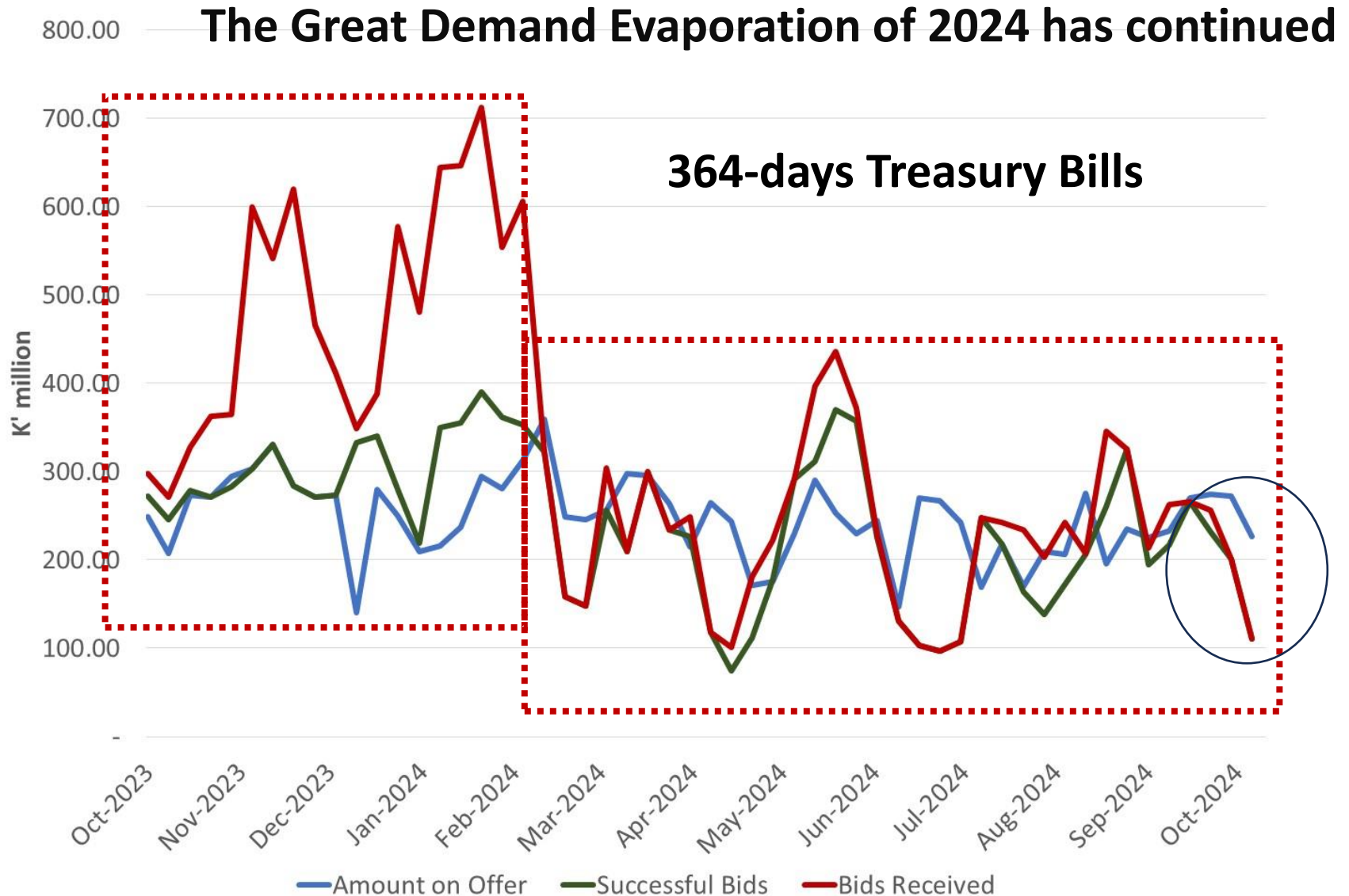
Further signs of trouble in Fixed Interest Markets

- Papua New Guinea fixed interest markets continue to paint a picture of a challenging funding market for GoPNG.
- 364-day Treasury Bills have risen sharply in recent months and traded at a yield of 7.92% during the week of 18 October 2024:

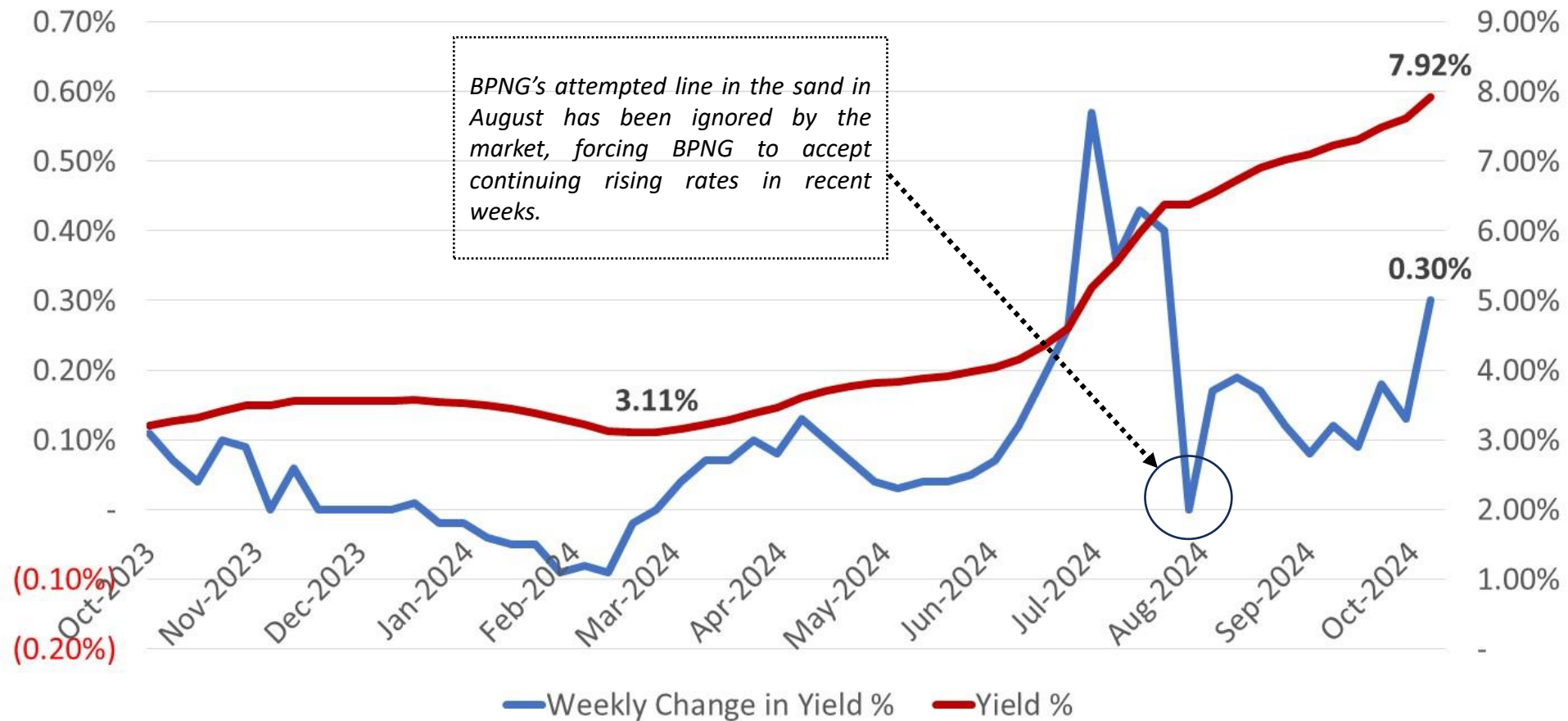
364-day Treasury Bills - Yield at Auction



Still A Tale of Two Markets



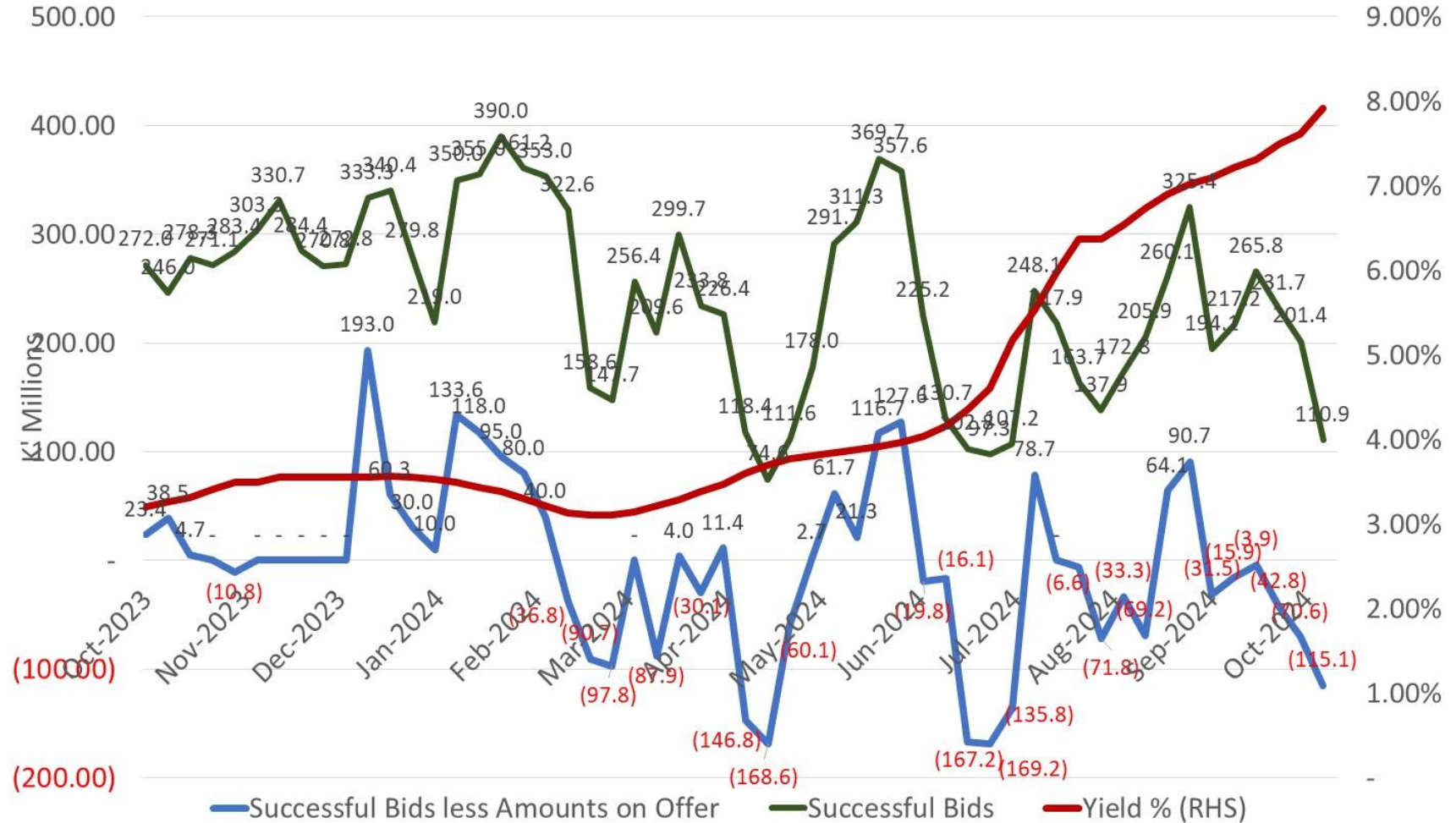
Market – BPNG 1 – 0 (half time?)



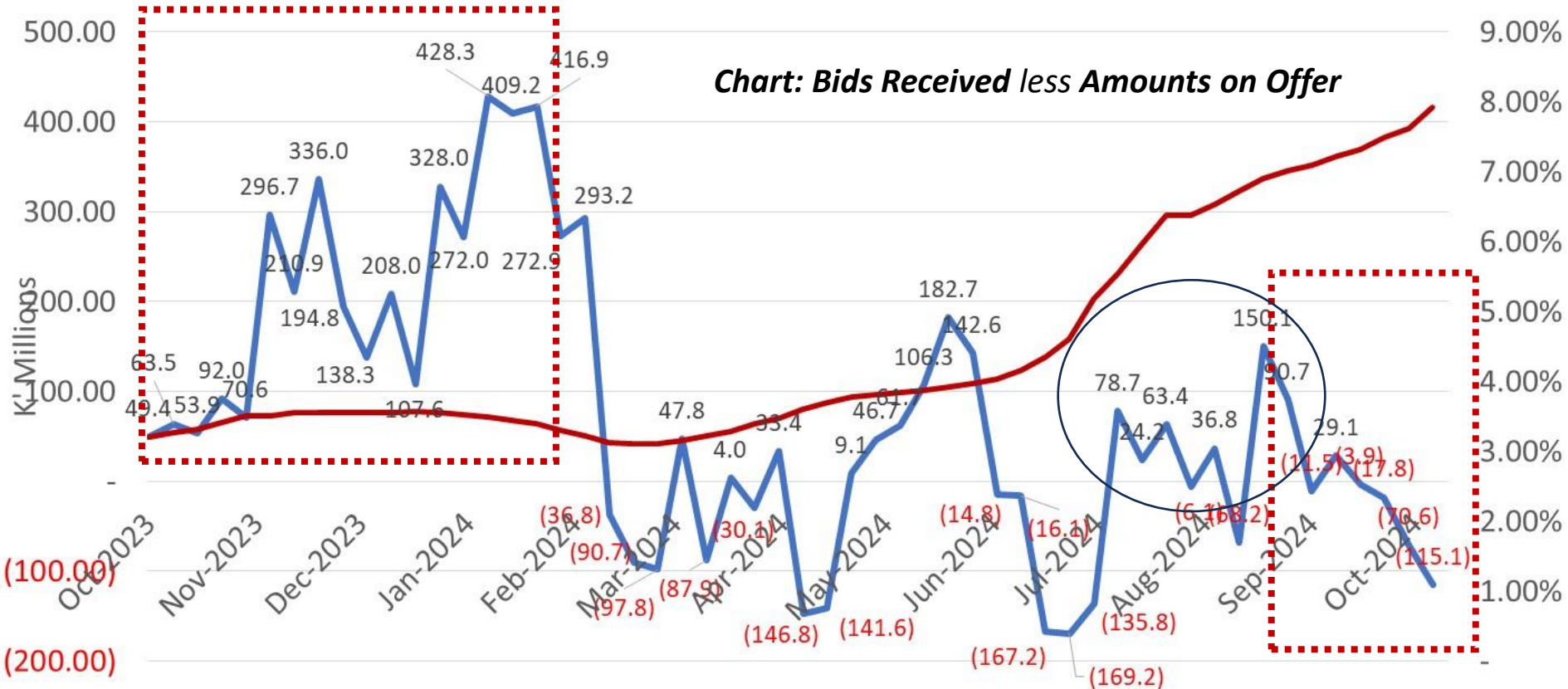
In our August 2024 market update, we pointed out that BPNG looked like it was testing the Market's Mettle by holding rates firm during one auction. Arguably, the market has forced BPNG into a retreat. Rates have risen at every single weekly auction since March, except the one in August where BPNG attempted to draw a line in the sand. At present, the weekly rise in yields appears to be accelerating.

It takes Two to Tango

Rates are rising (faster) but the deficit in bids is widening

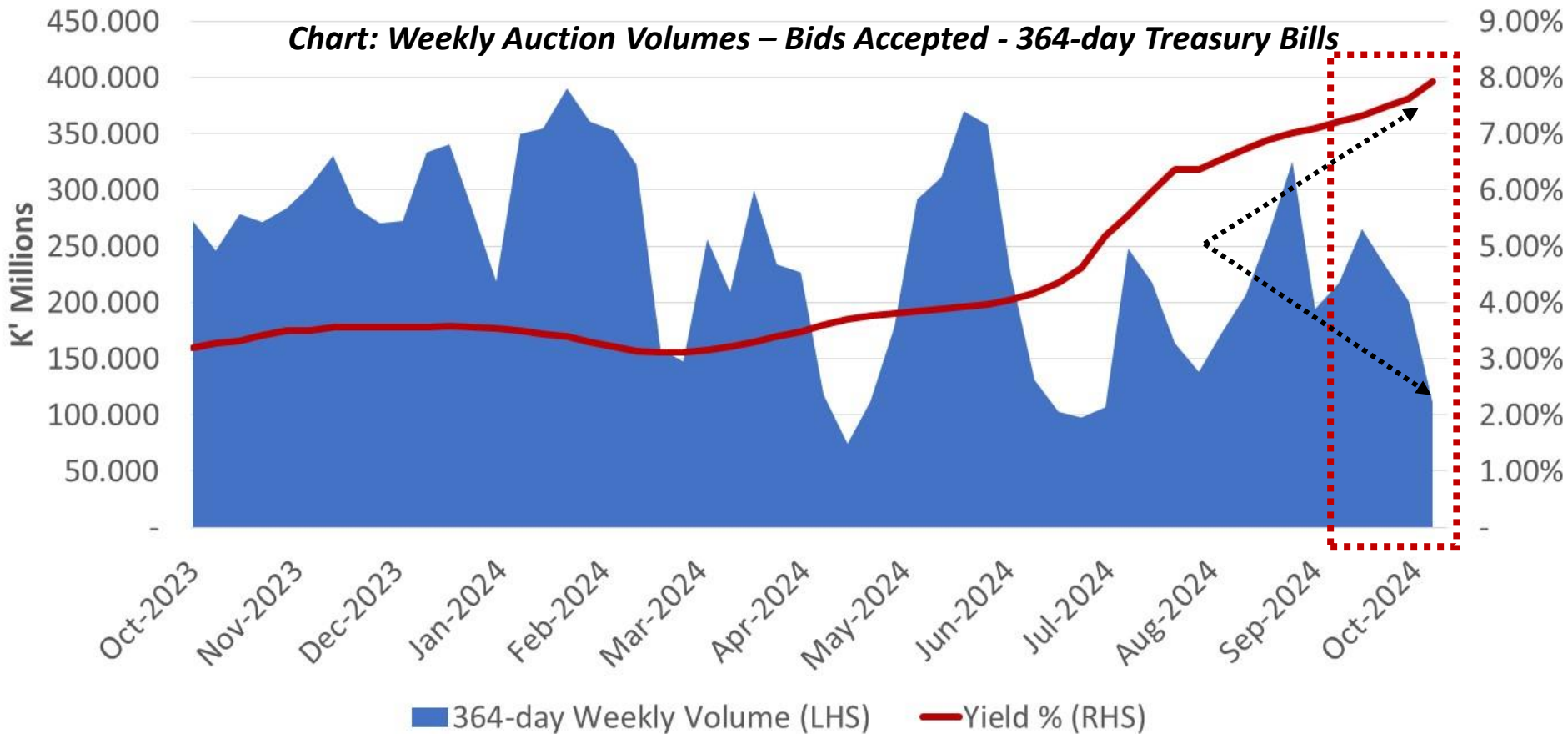


All out of puff?



After a period of what looked like a concerted effort by both BPNG and presumably institutional bidders to maintain reasonable order flow in parts of August and early September, the wind appears to have gone completely out of the market. The deficit of Bids Received compared with the Amounts on Offer at auction is deepening, possibly signaling an absence of pools of capital for fixed interest investing.

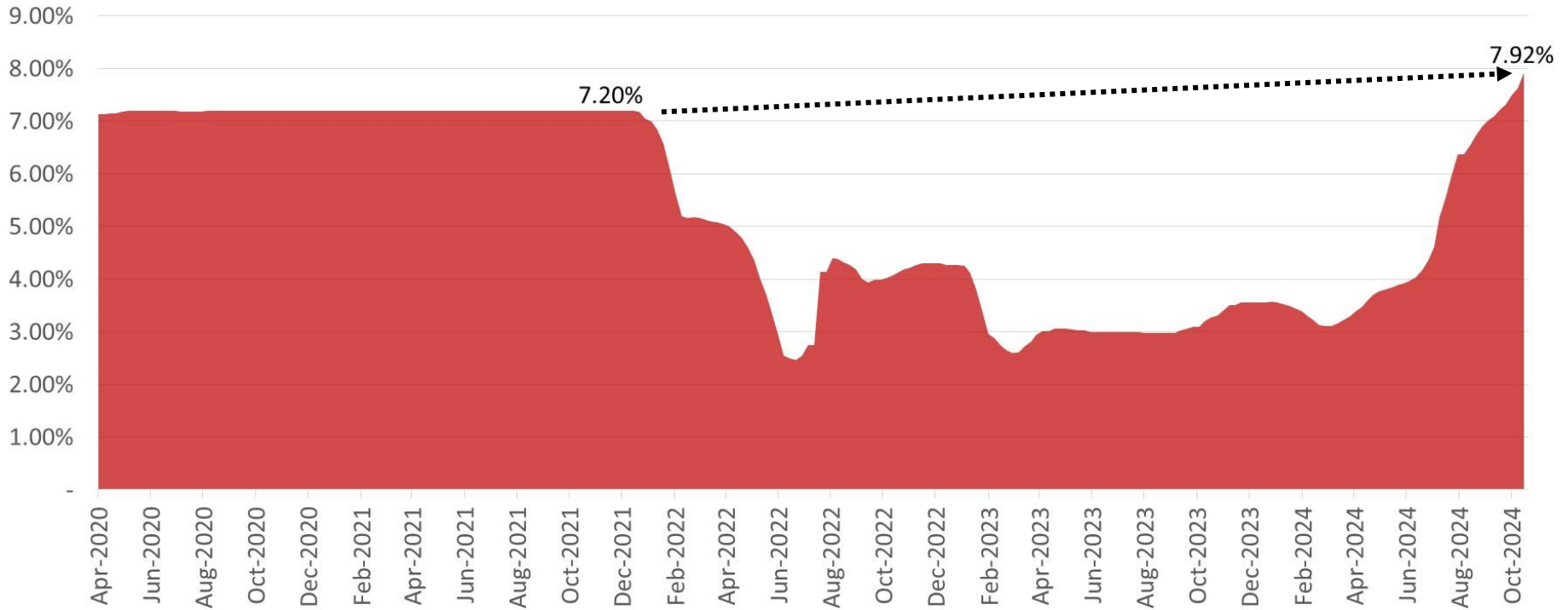
Where will rates have to go?



Where will rates have to go before they start attracting real volume to the primary auction market? Despite very strong growth in rates in recent weeks, bid volumes are cratering. One factor may now be the expectation that rates will continue to climb fast which discourages investors from bidding for fear of missing out on additional upside? Or is there simply no money out there to buy Treasury Bills?

The Bigger Picture

364 Day T-Bill Auction Results



364-day rates have blown past the long-held peak of 7.20% which held for several years up until BPNG and the Department of Treasury started squeezing rates in late 2021.

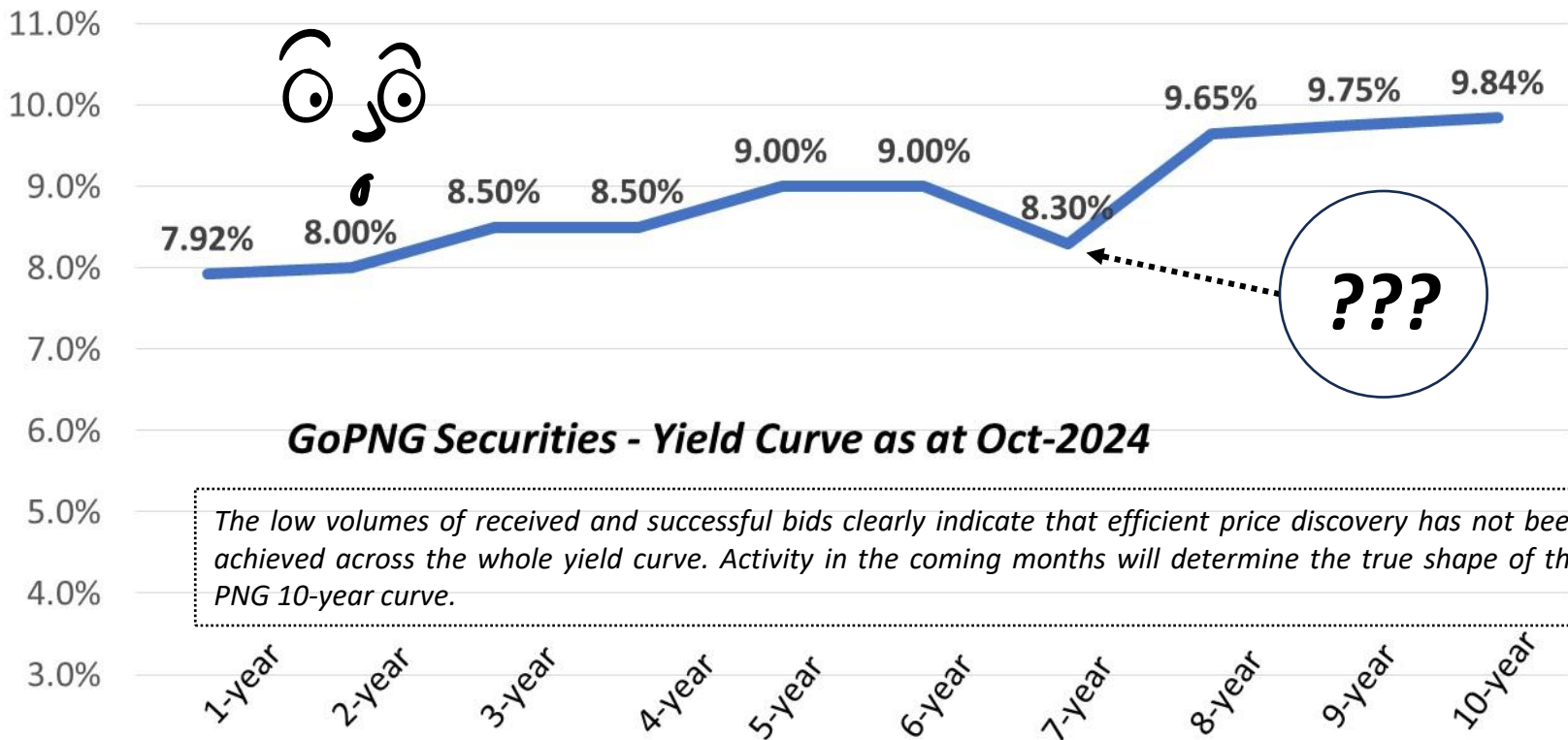
The inability or unwillingness to defend this limit leaves the market without real guidance as to any technical limits to the rise in rates during this cycle.

And GIS markets? Any update?

BPNG has shifted to much shorter intervals between GIS (long term bonds) auctions. From going for months on end without a fresh issuance, we are now seeing close to weekly auctions of smaller tranches of GIS.

In general, the bidding is pretty patchy in this market as well, with significant shortfalls in received and successful bids for most maturities when compared to the amounts on offer.

The resulting yield curve, such as it is, currently looks as follows:



What comes next?

- We believe the only way is up for Treasury Bill yields in the coming months.
- At this stage, the rise in rates and shortfall in auction volumes appears to be accelerating. This is of some concern in terms of whether GoPNG will be able to use the market to meet its financing needs in the coming months.
- The November 2024 handing down of the Fiscal 2025 National Budget will be an important event that will hopefully provide some increased clarity as to the position.
- Fixed Interest products have become significantly more attractive as an asset class at the moment, with yields slowly but surely starting to crowd out alternative investment options. This is clearly necessary and will need to be magnified in order to channel sufficient volumes of funding to GoPNG.
- It remains unclear how much further rates will run and how much this will increase demand. Our view is that rates are now set on a course for more than 9.00% in the 364-day tenor and we expect this to be reached before year-end.
- There is a significant non-zero probability of a serious fiscal crisis and for rates to spiral significantly higher in the coming months, however we do not yet believe this to be an inevitable outcome.
- As for GIS markets, we believe there needs to be significant additional auctions and successful bids before we are prepared to say that PNG has reestablished a realistic 10-year yield curve. In our view, that curve will be significantly higher and steeper than it currently presents.

**Some notes on Interest Rates
and Fixed Interest Markets in
Papua New Guinea**

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Investor Education Materials

A primer on instruments, yields and yield curves

Some readers may find all this talk about maturities and yield curves to be confusing and rather intimidating.

By way of an over-simplified explanation of how interest rates and yield curves work, we thought it useful to try to explain a few of the elements in the Papua New Guinea fixed interest markets:

- The government of Papua New Guinea (GoPNG) sets out its spending and funding plans annually through its National Budget.
- Simplistically, the National Budget authorizes certain expenditure by GoPNG during the year in question. The National Budget also forecasts how much money GoPNG will collect from the economy through taxes, levies and charges, dividends from investments etc.
- Since cash flows into GoPNG's coffers are lumpy and uncertain, depending in part on when large tax remittances and dividends from large SOEs such as OTML and KPHL happen, as well as the timing of flows from bilateral and multilateral development partners, GoPNG is permitted to fund its operations in the short term debt markets by issuing IOUs in the form of Treasury Bills. These are typically 91, 182, 273 or 364 days in maturity, meaning they all have to be paid back within less than 12 months.
- For longer term needs, such as for example the scenario where GoPNG is forecasting a budget deficit for the year, GoPNG may decide to issue longer dated debt which does not need to be repaid until some time after 12-months.
- In PNG, these longer dated securities are called Government Inscribed Stock or GIS.

A primer on instruments and yield curves cont'd

- BPNG acts as the Agent for GoPNG (through the Department of Treasury) in issuing the Treasury Bills and the GIS.
- This issuance (practically speaking meaning selling) is done through weekly (Treasury Bills) and intermittent (GIS) auctions organized and run by BPNG.
- At these auctions, BPNG will indicate the volumes (i.e. value of debt) that is on offer and investors will bid for these debt instruments.
- Treasury Bills are issued as Discount Securities, meaning that they are sold at a discount to their face value and on maturity the investor receives the face value.
- By way of example, a 364-day Treasury Bill with a PGK1,000 face value (amount repayable) may be sold to an investor at say PGK930.

	PGK
Face Value (amount repayable at maturity):	1,000
Sale Price at auction:	930
Interest to be earned during holding period:	70
Implied Interest Rate (yield):	7.53%

(being: $PGK70/PGK930 = 0.0753 * 100 = 7.53\%$)

For all you fixed interest maths boffins out there, this primer aims to explore concepts only. We do not profess to attempt to provide complete mathematical explanations of the various elements. Just enough to illustrate the broad concepts.

- When we talk about the 364-day yield rising to say 7.92%, what we are actually expressing is the fact that bidders at BPNG Treasury Bill auctions have reduced their bids (e.g. from PGK930 to say PGK925 from one week to the next, thereby indicating to GoPNG (the borrower – or seller of the Treasury Bills) that investors require a higher yield or interest rate for the same (364-day maturing paper) than they did the previous week.

A primer on instruments and yield curves 3

- The mechanics of this can be seen in the example below, where we illustrate that by bidders reducing their weekly bid for a PGK1,000 face value Treasury Bill from PGK930 to PGK925, the interest rate or yield to maturity of that Treasury Bill has increased from 7.53% to 8.11%:

	PGK
Face Value (amount repayable at maturity):	1,000
Sale Price at auction:	930
Interest to be earned during holding period:	70
Implied Interest Rate (yield):	7.53%

(being: $PGK70/PGK930 = 0.0753 * 100 = 7.53\%$)

	PGK
Face Value (amount repayable at maturity):	1,000
Sale Price at auction:	925
Interest to be earned during holding period:	75
Implied Interest Rate (yield):	8.11%

(being: $PGK75/PGK925 = 0.0811 * 100 = 8.11\%$)

- Longer dated GIS securities are not issued as discount securities, rather they are issued with a Coupon or interest payment attached.
- In PNG, GIS pays a Coupon (or interest) twice a year, usually in May and November.
- The GIS are usually issued (sold) with a Coupon (interest payment) rate that is pretty close to the estimated market interest rate for securities of that tenor. This means that these securities are usually sold to investors at a price that is pretty close to the amount that will be repaid when they mature.
- For example, GoPNG, through BPNG acting as the agent for the Department of Treasury may issue PGK1,000 in GIS paying an annual Coupon (interest) of 9.00% and maturing in 3 years. Since Coupon payments are semi-annual, this actually means that this GIS will pay interest of PGK45 (half of 9.00%) in May and another PGK45 in November of each year until they mature in 3 years and the PGK1,000 is also returned to the investor.

What is in the yield or interest rate?

- When lending money to GoPNG by buying Treasury Bills or GIS, investors are expecting to be paid back the amount they lend plus an amount of interest.
- However, what determines the rate of interest that investors will charge GoPNG? The simple answer is that interest rates are made up of two main components:

1. **Inflationary expectations:**

Investors expect to receive some compensation for the extent to which they will not be having their money in their own pockets (having lent it to GoPNG) for the purposes of expenditure today. Inflation in the economy will erode the value of the money that GoPNG will pay them back in the future and investors will demand that GoPNG compensate for this when determining the interest rate on the amounts lent.

2. **Real Interest Rate:**

In addition to being compensated for the extent to which future expected inflation will erode the value of the money they have lent to GoPNG by buying Treasury Bills and GIS, investors will also expect some measure of a real return (meaning over and above inflation) which should reflect the risks and opportunity costs (other possible investments) that the investors incur by lending their money to GoPNG.

- Consequently, the interest rate that investors demand from GoPNG is an amalgam of these two components: inflationary expectations and a real return over and above price increases in the general economy such that investors have a net positive return after taking into account inflation.

What does the yield curve look like?

- Imagine we are at the end of 2024 and we envisage a scenario where the consensus expectation as to inflation into the future is as follows:

	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Expected Inflation	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%

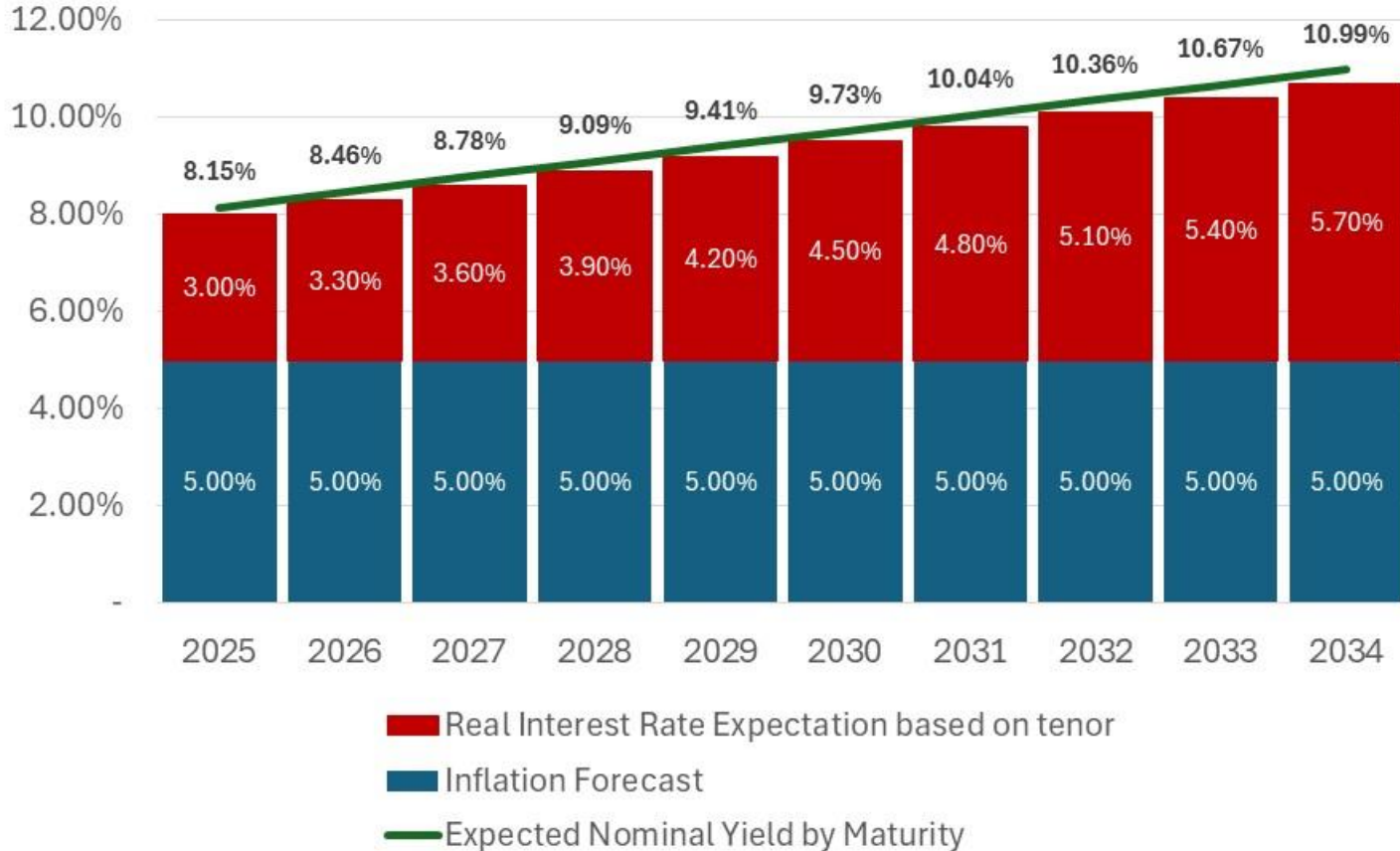
- Then imagine, without further analysis or explanation (for now) that the market consensus is that, in order for investors to agree to lend money to GoPNG for 1, 2, 3 and more years, all the way up to 10 years into the future, investors demand the following *Real Return*, meaning return over and above what the same investors think is going to be the reduction in the purchasing power of their money over the various periods:

	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Expected Real Interest Rate on GoPNG Paper per annum	3.00%	3.30%	3.60%	3.90%	4.20%	4.50%	4.80%	5.10%	5.40%	5.70%

- The above *Real* rates of return should be read as being the amount of interest demanded by investors over and above each year's inflationary expectation until maturity. For example, a person contemplating lending money to GoPNG at the start of 2025 for a period of 2 years would require compensation for his or her expected inflation in 2025 and 2026, plus 3.30% in additional *real* return for each of the two years.
- You will note that we have assumed that the Real rate of return required increases the longer we propose to lend the money. Whilst our numbers are for illustration purposes only, this makes some intuitive sense I am sure. For example:
 - The longer you lend someone money, the longer you run the risk of that person (or entity) going broke or having financial difficulties to the point of being unable to pay you back. This includes GoPNG;
 - The greater the possibility that you have got your estimates of future inflation wrong and inflation will be higher in at least some of the periods than you have forecast;
 - The longer you will be unable to spend or invest your money differently, thus reducing your own utility or satisfaction; and
 - A myriad of other factors increase your risks.

What does the yield curve look like?

- When you add these factors together and analyze the interest rate that investors will demand from borrowers such as GoPNG over various time frames, you will get a yield curve that looks a bit like the one below:



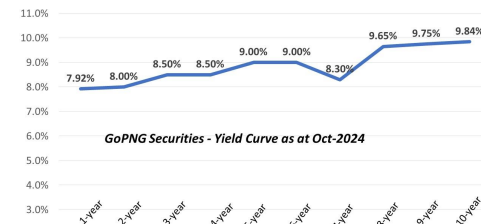
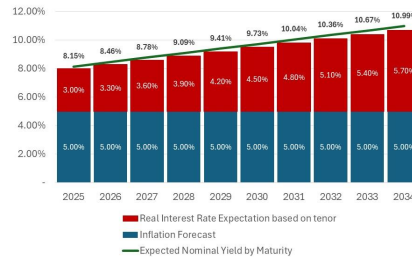
- The above graph shows that, in our hypothetical example, investors considering buying 364-day Treasury Bills at the start of 2025 will require a yield of 8.15%, whereas another investor contemplating buying GIS maturing in 2028 (4-years) will require an annualized interest rate for each of the intervening years of 9.09%.

Some things to note

- Whilst looking at the chart on the previous page, you may have noticed that the annual values in the yield curve are somewhat greater than the sum of the real interest rates and the expected inflation.
- The reasons for this is two-fold:
 1. In calculating the nominal interest rate (which incorporates the inflation expectation), we take the product and not the sum of the two components. As such, the calculation of the required yield for the 364-day (one year) Treasury Bills is determined as follows:

$$((1+0.05)*(1+0.03)) - 1 = 8.15\%$$

2. We have assumed that the required real rate of interest increases the longer you are considering lending money to GoPNG. Our numbers are arbitrary and for illustration only, however I am certain you will agree that this is reasonable in principle. When calculating the required yield over a multi-year holding period, we take the product of each year's inflation expectation and the annual real interest rate required for that entire holding period.
- You can now compare our hypothetical yield curve on page 16 with the current best estimate of the GoPNG yield curve from page 8 of this report:



- Do you think you are able to estimate what represents compensation for expected future inflation and what is the *real interest rate* in the current GoPNG yield curve?

The inverted yield curve

- JMP Securities has expressed some reservations as to whether or not the current PNG long term yield curve actually represents the real state of the market, given current investor reluctance and the very low volumes of trades in the long-dated GIS maturities.
- Nevertheless, and without stretching the point too far, the shape of the yield curve helps us illustrate an important point in relation to the interplay between long and short-term inflationary expectations and the shape of the yield curve.
- Currently, the PNG yield curve indicates that investors demand 9.00% to lend money to GoPNG for 6 years and 8.30% to lend money for 7 years. Does that make sense?
- Since we don't believe the current curve reflects actual market realities, we will not focus on this specific issue from the PNG yield curve, but rather use it as a catalyst to explore the way in which longer dated market yields may potentially be lower than shorter dated rates.
- As you will have guessed by now, the key lies in long term inflation expectations.
- It is unlikely that a long-term investment (e.g. a long-dated GIS) will have a lower expected real rate of return than a short-dated investment. Time means uncertainty and this will increase rather than reduce risks and risks typically demand compensation.
- One notable exception is the expectation of inflation. This is one variable which investors may think is a problem in the short term but likely to stabilize or improve over the long term, for example by reverting to some sort of long-run average.

Please note: We are illustrating a point using a quirk of the current PNG yield curve. We are not suggesting that the actual yield curve in PNG is inverted

The inverted yield curve cont'd

- Let's look at an example. Now, let me warn the boffins again that our example and calculations have been simplified for illustration purposes:

	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Expected Inflation	8.00%	5.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
Real Interest Rate (12 months)	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
Expected Real Interest Rate on GoPNG Paper per annum	3.00%	3.30%	3.60%	3.90%	4.20%	4.50%	4.80%	5.10%	5.40%	5.70%
Annual Expected Return on 1 year paper	11.24%	8.15%	6.09%	6.09%	6.09%	6.09%	6.09%	6.09%	6.09%	6.09%
Compound Rate of return on sequence of 1-year investment	11.24%	9.68%	8.47%	7.87%	7.51%	7.27%	7.10%	6.98%	6.88%	6.80%
Expected Yield - Multi-year paper	11.24%	10.00%	9.10%	8.81%	8.77%	8.84%	8.98%	9.16%	9.37%	9.60%

- From the above data, we can see that the hypothetical version of the PNG economy is experiencing a current bout of inflation which is expected to moderate over the next couple of years, dropping from 8.00% to a long-term trend of 3.00%.
- Fixed interest investors now have choices to make:
 - Do we invest in a series of 364-day Treasury Bills (1-year paper) every year on a rolling basis so as to keep our risks to a minimum and flexibility to a maximum?; or
 - Do we invest in longer dated paper with a view to lock in higher returns over a longer aggregate period?
- A few factors to consider: Real Interest Rate (12 months) is stable at 3.00%, representing the idea that if we make short term decisions and invest only for 12-months at a time, then we expect the real rate of return for each discrete 12-month period to be unchanged over the coming 10 years. This is a simplifying assumption which is meant to illustrate the point that if we insist on investing on a rolling short-term basis, we will not be able to avail the premium return that investing over a longer period may offer.

The inverted yield curve 3

- The Expected Real Interest Rate on GoPNG Paper per annum is a revisiting of the idea that real interest rates are likely to be higher the longer we are willing to invest:

	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Expected Inflation	8.00%	5.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
Real Interest Rate (12 months)	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
Expected Real Interest Rate on GoPNG Paper per annum	3.00%	3.30%	3.60%	3.90%	4.20%	4.50%	4.80%	5.10%	5.40%	5.70%
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Compound Rate of return on sequence of 1-year investment	11.24%	9.68%	8.47%	7.87%	7.51%	7.27%	7.10%	6.98%	6.88%	6.80%
Expected Yield - Multi-year paper	11.24%	10.00%	9.10%	8.81%	8.77%	8.84%	8.98%	9.16%	9.37%	9.60%

- The Annual Expected Return on 1 year paper is the discrete yield on 1-year paper for each holding period over 10 years:

	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Expected Inflation	8.00%	5.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
Real Interest Rate (12 months)	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
Expected Real Interest Rate on GoPNG Paper per annum	3.00%	3.30%	3.60%	3.90%	4.20%	4.50%	4.80%	5.10%	5.40%	5.70%
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Compound Rate of return on sequence of 1-year investment	11.24%	9.68%	8.47%	7.87%	7.51%	7.27%	7.10%	6.98%	6.88%	6.80%
Expected Yield - Multi-year paper	11.24%	10.00%	9.10%	8.81%	8.77%	8.84%	8.98%	9.16%	9.37%	9.60%

- The Compound Rate of Return on sequence of 1-year investments represent the compound yield achieved over longer period by the investor who only buys rolling 1-year paper at the discrete annual yields:

	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Expected Inflation	8.00%	5.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
Real Interest Rate (12 months)	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
Expected Real Interest Rate on GoPNG Paper per annum	3.00%	3.30%	3.60%	3.90%	4.20%	4.50%	4.80%	5.10%	5.40%	5.70%
Annual Expected Return on 1 year paper	11.24%	8.15%	6.09%	6.09%	6.09%	6.09%	6.09%	6.09%	6.09%	6.09%
Compound Rate of return on sequence of 1-year investment	11.24%	9.68%	8.47%	7.87%	7.51%	7.27%	7.10%	6.98%	6.88%	6.80%
Expected Yield - Multi-year paper	11.24%	10.00%	9.10%	8.81%	8.77%	8.84%	8.98%	9.16%	9.37%	9.60%

The inverted yield curve 4

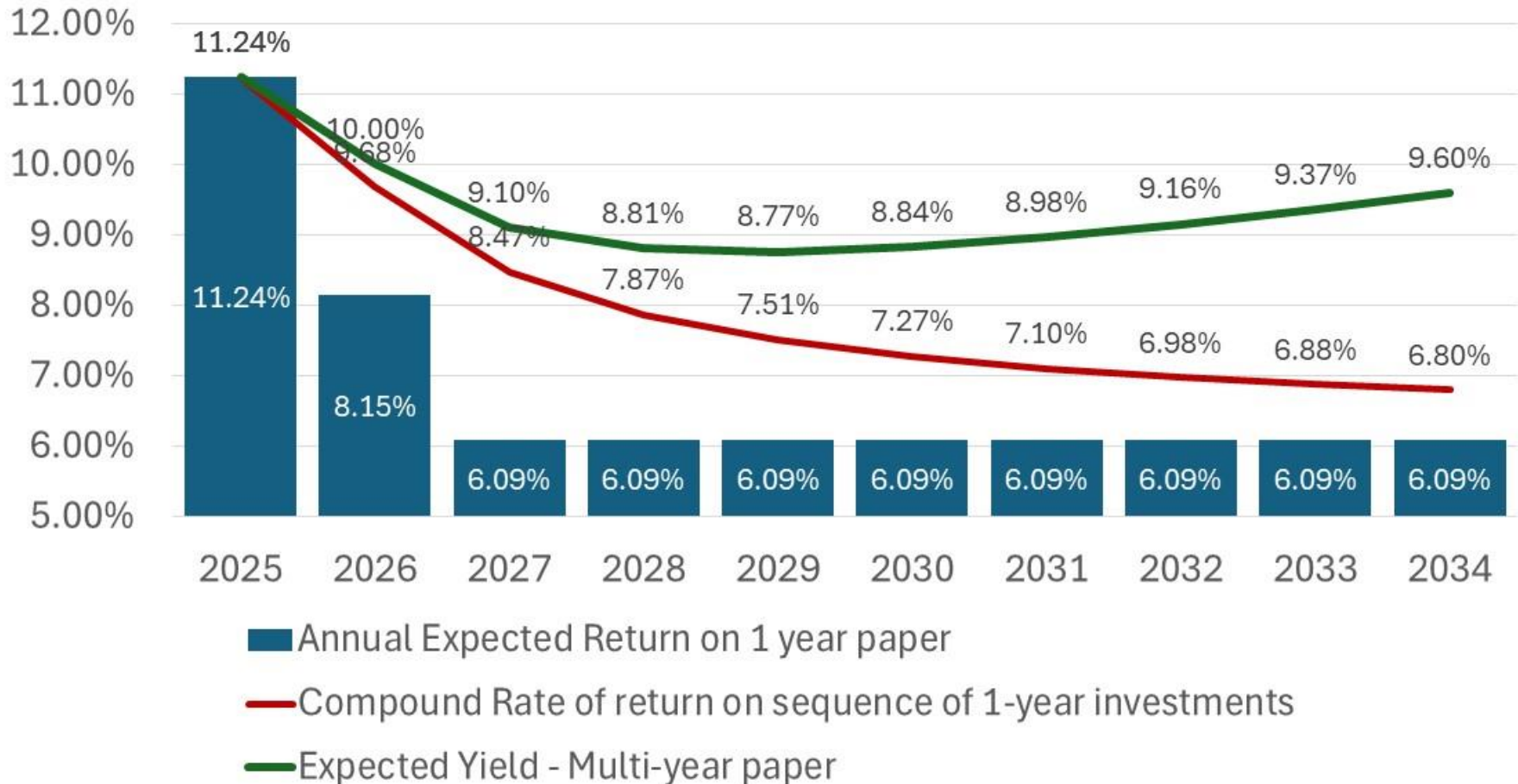
- The Expected Yield – Multi-year paper is the yield to investors who are willing to commit for longer period than 1-year and therefore avail themselves of the rising real interest component associated with investing longer term:

	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Expected Inflation	8.00%	5.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
Real Interest Rate (12 months)	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
Expected Real Interest Rate on GoPNG Paper per annum	3.00%	3.30%	3.60%	3.90%	4.20%	4.50%	4.80%	5.10%	5.40%	5.70%
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Compound Rate of return on sequence of 1-year investment	11.24%	9.68%	8.47%	7.87%	7.51%	7.27%	7.10%	6.98%	6.88%	6.80%
Expected Yield - Multi-year paper	11.24%	10.00%	9.10%	8.81%	8.77%	8.84%	8.98%	9.16%	9.37%	9.60%

- We have assumed that the annualized real interest rate remains at 3.00% per annum when considered each year on a 12-month look forward basis but that the risk premium or real interest rates increase as longer timeframes are considered.
- We have amalgamated both inflation risk premium and real return premium in our real interest estimates. This to simplify the analysis and exposition. The sum of these two risks is commonly referred to as the *term premium*.

How does it look in the end?

- The chart below illustrates the different outcomes to investors based on their choices whether to go long or pursue a series of short term investments in our hypothetical example:



- From the above, we can see ‘how’ a yield curve can be downward sloping or inverted for some or all future periods based on changes in long term inflationary expectations.

JMP Securities can assist you:

- In addition to being a Participating Organisation on PNGX, Papua New Guinea's national stock exchange, JMP Securities is a licensed funds manager and an authorized bidder in Bank of Papua New Guinea's primary fixed interest markets – both T-Bills and GIS.
- Our advisors can assist you in gaining an understanding of local market conditions and assist you in formulating and executing investment strategies in both equities and fixed interest markets.
- All investments involve risk and we encourage all clients develop a detailed understanding of your own personal financial and life circumstances, formulate clear investment objectives and work with your advisors to develop an actionable investment plan that takes each of these factors into account.

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