Mars Updates

# Exploring Mars Protocol's dynamic interest rate model

JUNE 23, 2021


*Mars Protocol's dynamic interest rate model was first introduced in a paper by Delphi Labs available here. Below, we explore the implications of this innovative new model.*

Traditional financial markets may not have realised it yet, but we're living through a generational change in credit markets.

In the old world financial system, interest rates on loans and deposits are determined by two key factors:

1. The term (or duration) of a loan.
2. The rates set by central banks (which lend money at those rates to commercial banks).

Rates on credit protocols like $AAVE and soon $MARS are driven by different rules.

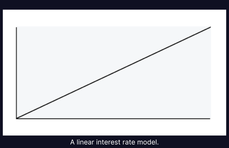
The way most prominent DeFi protocols work is automated and transparent. They're rarely subject to terms or fixed durations, and that makes them more flexible. You can borrow $10 (or $10 million) without committing to a hard date for repayment.

Central banks have little impact on credit protocol rates. Instead, interest rates on crypto loans are driven by liquidity and market demand. If there's a lot of borrowing demand for a given token, rates rise. The opposite is also true (low demand = low rates).

So how do credit protocols set their rates?

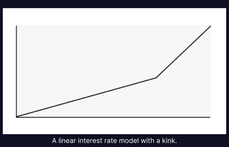
To date, most protocols have taken a very straightforward approach. They fall into three broad groups:

**1. Linear rates.** Rates increase based on demand.



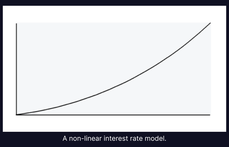
A linear interest rate model.

**2. Linear with a kink.** Rates follow 2 slopes: a lower slope before an optimal utilisation level and a steeper slope after that level. The kink is created by the difference between the 2 slopes.



A linear interest rate model with a kink.

**3. Non-linear.** The rate is set by a predefined curve.



A non-linear interest rate model.

While these approaches have proven successful to date, there are enormous opportunities for improvement. See, all three interest rate models share a problem: they can't adapt to active changes in market conditions.

That's why some assets on today's leading credit protocols are frequently over-utilised… meaning that they've lent more than they want to. When that happens, users who want to withdraw their deposits may be unable to do so.

$MARS will be different.

We will be the first credit protocol in the world to feature dynamic interest rates. Rates will not be defined by a pre-determined curve but will rather evolve based on market conditions.

Our dynamic rates will be handled by a "PID Controller" or proportional-integral-derivative controller.

It's a terrible name, we know, but it's a common mathematical concept used in lots of places outside of finance.

The classic example of a PID Controller is the cruise control on a car. Maintaining a fixed speed is simple on a flat surface. But as soon as you hit a hill, the car's computer must adapt to changes in gravity. That means the car must apply more gas when going uphill and decelerate when going downhill. Enter the continually-running mathematical formulas of the PID Controller.

$MARS' dynamic interest rates will operate similarly. Thanks to an integrated PID Controller, we'll adjust rates based on changes in supply and demand to target an optimal utilisation level. On a per-block basis, rates will be re-calculated using the following formula.


Algorithm to calculate the borrow interest rate.

Rates will also be looked at holistically. For example, if one market is underutilised, we will decrease interest rates to boost demand within that market and vice versa when the market is over-utilised.

The model is under development by Delphi Labs, which is working with IDEO CoLab to incubate Mars Protocol.

You can dive extraordinarily deep into mathematics behind our dynamic interest rate model here.

But right now, we're thinking big picture. What does all this mean on a macro level?

First, the success of existing credit protocols shows there's a whole new credit ecosystem that's developing in parallel to the old world financial system.

Power is quietly shifting from the old world financial system to the new. This will only accelerate as blockchains become truly cross-chain and assets like $LUNA, $BTC, $ETH, and $MARS siphon off some of the value-storing characteristics of fiat.

We envision a future where literally ALL credit-based transactions shift from centralised, old world systems to decentralised, fully-automated protocols.

Today's protocols hold billions of dollars in value. They will soon hold trillions.

Two years ago, such a statement might have sounded ludicrous. Today, it feels inevitable, and we believe it will happen much faster than the old world participants realise.

When Mars launches, it will first feature the proportional (p) term… the "P" in "PID Controller". As we gauge the impact with real-world usage, we'll launch the Integral and Derivative terms. That will give Mars a fully dynamic interest rate model that's never been used before within credit protocols. It will adjust to actual market conditions, and in the process it will maximise rewards for lenders, borrowers and stakers (who earn a cut of the protocol's fees). Mars will quite literally adapt to credit conditions like the cruise control on your sedan.

We're approaching finance at the speed of light.

And our dynamic interest rate model will drive new efficiencies that will supercharge adoption.

We recognise "PID Controller" may be one of the worst-sounding names in history… but it doesn't matter. It has the potential to profoundly change credit markets forever.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