

TAKADAO

Whitepaper

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

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PART ONE

01 - Background

Islamic finance and insurance

Islamic finance is most easily understood in contrast to conventional finance. The global financial system is underpinned by interest-based principles that result in inflationary systems. These systems reward spending today and penalize saving for tomorrow. Islamic finance eschews *riba*, or interest, in favor of wealth preservation and growth through equity investments and the sharing of risk. While it is not within the scope of this paper, it is arguable that Islamic finance offers the answer to today's social justice issues, stemming from widening financial inequality both within and across nations¹.

When it comes to finance, the shariah is a prohibitive code that is focused on defining what is prohibited, instead of legislating what is not prohibited. As such, anything that is not specifically prohibited is therefore allowed². The main shariah prohibitions in finance are:

- Prohibition of *Riba* (interest)
- Prohibition of *Gharar* (uncertainty)
- Prohibition of *Maisir/Qimar* (gambling)

We'll explain these prohibitions in more detail in the following section on Islamic insurance, or *Takaful*.

Islamic banking constitutes 6% of global banking today³, making incredible strides from its modest beginnings in the late 1970s⁴. And yet, room for growth is enormous. Muslims today comprise 24% of the global population and are projected to grow to 31% by 2060. Even if Islamic finance served only the "niche" Muslim audience, it should still grow to catch up with the population. Currently, Islamic finance boasts an annual growth rate of 14%⁵, accelerating much faster than traditional finance.

Considering the advent of bitcoin, cryptocurrencies and blockchain technologies, it appears that Islamic finance is poised to grow beyond expectations. The anti-inflationary fundamentals of bitcoin and the ethos of decentralization are giving new tools upon which to build Islamic

¹ El Diwany, 1997

² Ayub, 2007, p.22

³ Modor Intelligence, 2021

⁴ Ayub, 2007, p.13

⁵ Modor Intelligence, 2021

finance. Never has there been a better time to start reformulating global finance according to Islamic principles, that promise a return to social justice and happier societies.

Why is conventional insurance not shariah-compliant?

Islamic insurance is a touchy subject among Muslims. Because conventional insurance is widely understood to be prohibited, the very idea of insurance has been conflated with the prohibition on conventional insurance; as a result, many Muslims think that insurance as a concept is prohibited by Islam completely. Some say that everything happens by the Will of Allah and by insuring against them, one is trying to go against the Will of Allah.

Such a position has not been confirmed by the words and actions of Prophet Muhammad (pbuh) himself, who not only instructed Muslims to “tie your camel first, then put your trust in Allah,”⁶ but approved the practice of Aqilah, common in early Islamic societies where members of a tribe contributed to a joint fund used to relieve hardships from disasters.⁷

In fact, there is no disagreement among scholars that the practice of preparing against known risks is permissible, the only prohibition is on the way insurance is practiced when it incorporates *riba*, *gharar* and *maysir*.

Riba, commonly known as interest, is the profit generated on loaning money. This profit includes monetary and non-monetary profits, as long as they have financial value.⁸ Conventional insurance companies invest customer premiums into interest bearing instruments and therefore are *riba*-based and impermissible. In addition, scholars highlight the insurance contract itself as including *riba* since a small sum of money (premiums) is exchanged for a large sum of money (claims payment). The excess amount of the claims payment over the premiums is considered a form of *riba*.⁹

Gharar refers to uncertainty in commercial contracts and what each party to the contract should receive.¹⁰ In the case of conventional insurance, it is often the case that the insurance benefit is undefined and dependent on many factors, including subjective factors. For instance, car insurance has an undefined benefit. The amount that is paid by the insurance company is dependent on the extent of the damage and the insurance company may not approve the costs

⁶ Sunan al-Tirmidhī 2517

⁷ During the later stage of the period of the second caliph, Sayyidina Umar, ® the Caliph, directed that in the various districts of the State, lists of Muslim brothers-in-arms should be drawn up. The people whose names were contained in those lists owed each other mutual assistance or co-operation and had to contribute to the payment of diyat (bloodwit) for manslaughter committed by one of their members of their own tribe. This was how Sayyidina Umar ® developed the practices of the doctrine of a IAqilah. (See in Gibb, 1991, p.29f.)

⁸ A deeper discussion on the different forms of *riba* can be found in chapter 3 of “Understanding Islamic Finance” (2007) by Muhammad Ayub.

⁹ Tolefat and Asutay, p.20

¹⁰ Ayub, 2007, p.57

quoted by certain repair shops. There is a high level of uncertainty as to what the insured actually receives from the insurance contract.

Finally, conventional insurance is based on the transfer of risk, a concept in itself inconsistent with shariah principles.¹¹ In such contracts, the insured/customer is paying the insurer/company to take on all the risk associated with the occurrence of a specific adverse event. If tragedy strikes, the insured/customer will receive a payout and is the winner of the contract. If nothing happens, the insurer/company keeps all the premiums and is the winner of the contract. This is a zero-sum game where either the insured wins or the insurer does; the interests of the insured and insurer are not aligned. This kind of contract invalidates conventional insurance on the prohibition of *maisir*, or gambling.

Why we came up with TAKADAO

It is not difficult to see why Islamic scholars have prohibited conventional insurance. Even from a non-Muslim point of view, conventional insurance is a raw deal. Insurance is commonly viewed as a necessary evil, and insurance companies “are needed, but not liked, relied on, but not trusted”.¹²

Fortunately, shariah principles have provided us with a better model of “insurance”, commonly practiced as Takaful, a form of cooperative insurance practiced in many Muslim countries today. The underlying principle of Takaful is one of mutual cooperation and aid.

We believe that there is a need for Takaful worldwide; not only for Muslims, but for every person who does not agree with the way conventional insurance is managed today. The blockchain, crypto and DAOs have given us an unprecedented way of building a truly cooperative insurance company based on Takaful, ensuring transparency and fairness and empowering the community to mutually aid and assist one another.

02 - Takaful Basics

Historical precedent for Takaful & Takaful in the world today

Various kinds of insurance schemes existed in the pre-Islamic period in the Arab world, many of which continued into the Islamic era. Under Umar ibn Al Khattab, the Khalifa Ar Rashideen, the government encouraged residents to perform Al Aqilah; the practice of sharing blood money liability among a specified group of people¹³.

¹¹ Need reference

¹² Eardly, 2021.

¹³ Salman and Htay, 2013, p241

The system of Aqilah was further expanded in the second century of the Islamic era when Muslim Arabs began trading in India and Asia. Groups of traders would enter into a joint guarantee to help one another in times of disaster or misfortune¹⁴. As time advanced, other insurance schemes were created until the 19th century, when a Hanafi jurist, Ibn Abidin (1784 - 1836), introduced the idea of insurance as a legal practice¹⁵ in Islamic jurisprudence.

'Takaful' stems from the Arabic verb 'kafala', which literally means 'mutual guarantee' or in a broader sense, a treaty guaranteeing members in a group against damage or loss suffered by any of them.¹⁶

The first modern Takaful companies were established in 1979 in Sudan by Faisal Islamic Bank and subsequently other companies were set up in Bahrain and the UAE. In 1984, Malaysia passed the Takaful Act that served as a launchpad for takaful companies. To date, there are more than 300 takaful companies operating in various regions worldwide.

The "global takaful insurance market was valued at \$24.85 billion in 2020, and is projected to reach \$97.17 billion by 2030, growing at a CAGR of 14.6% from 2021 to 2030"¹⁷. This growth has been driven by three main markets, Saudi Arabia, Malaysia and Iran and continues to be rooted in traditional financial infrastructure. Despite this large growth opportunity, there have been no notable takaful companies in the crypto and web3 world.

Fundamental principles of Takaful and Shariah compliance

Takaful is defined as "a scheme based on brotherhood, solidarity and mutual assistance which provides for mutual financial aid and assistance to the participants in case of need whereby the participants mutually agree to contribute for that purpose."¹⁸

In practice, a group of individuals pool funds together with the intention of providing financial assistance to one another as insurance against a defined risk. The intention, or *niyah*, is that of mutual aid and stems from the fact that the funds are contributed as donations, partial or full, for the specific purpose of insuring against risks. The funds are used to compensate the Takaful Operator (the company that manages the funds on behalf of the participants), to pay claims against adverse events, and invested for returns. In case there are funds remaining after these activities, they are redistributed back to the original contributors.

It is easiest to understand takaful in contrast to conventional insurance.

¹⁴ From Akram's Sprint 1 doc: <http://shorturl.at/alwS9>

¹⁵ Klingmuller, 1969. P.13

¹⁶ From Akram's Sprint 1 doc: <http://shorturl.at/alwS9>

¹⁷ Goswami, Pramod & Kumar, 2021.

¹⁸ The Takaful Act 1984 of Malaysia

Takaful vs. Conventional Insurance

	Takaful	Conventional Insurance
Purpose/Intention	<i>Mutual aid and risk sharing</i>	<i>Risk transfer</i>
Operator/Company	<i>The Takaful operator manages the funds on behalf of the participants as a group and is paid an operating fee and some incentive on investment returns (if any)</i>	<i>The relationship between the insurance company and policyholders is on a one-to-one basis. Policyholders are customers. Premiums are revenue for the company</i>
Insurer v. Insured	<i>The participants are both the insurer and the insured and bear the risk and reward from insurance activities</i>	<i>The insurance company is the insurer and bears all the risk and reward from insurance activities. The customer is the insured.</i>
Payment of Contributions/Premium	<i>Contributions are paid as partial or full donations</i>	<i>Premiums are paid as an expense and cost of purchasing an insurance policy</i>
Ownership of Contributions/Premiums	<i>Contributions are owned by the participants as a group</i>	<i>Premiums are owned by the insurance company</i>
Use of Contributions/Premiums	<i>Contributions are used to pay claims, direct expenses of the fund, takaful operator fees, and invested for returns</i>	<i>Premiums are revenue for the insurance company, they are used to pay claims, operating costs and invested for returns</i>
Treasury Management	<i>Invests in shariah compliant investment vehicles only</i>	<i>No restriction on types of investments</i>
Underwriting Surplus/Loss	<i>Belongs to the participants</i>	<i>Belongs to the insurance company</i>
Investment Returns/Losses	<i>Belongs to the participants</i>	<i>Belongs to the insurance company</i>

Takaful in light of the Shariah

As we highlighted in the section on Islamic finance and insurance, there are 3 main principles that cause conventional insurance to fall outside of shariah boundaries. Let's examine how Takaful resolves these issues.

1. Prohibition of *Riba* (Interest)

Takaful funds are invested in shariah-compliant investment portfolios that are free from *riba*. Moreover, because takaful contributions are intended as donations for a specific purpose, they

are not loans with interest; while claim payments are usually larger than contributions, the excess amounts paid are considered donations from others in the community, and not interest on a loan.¹⁹

2. Prohibition of *Gharar* (uncertainty)

Gharar is broadly defined as “uncertainty and risk-taking as well as excessive speculation, gambling and ignorance of the material aspects of contracts”²⁰. *Gharar* invalidates financial commutative (*muawada*) contracts, in other words, contracts that exist with a commercial purpose. *Gharar* does not invalidate gratuitous contracts based on donations (*tabarru*). If we take the example of a lottery, it is considered a commercial contract with excessive *gharar* and is therefore invalid and impermissible. A donation for a specific purpose (such as takaful contributions) is a gratuitous contract as there is no expectation of return as long as the specific purpose is fulfilled. Hence, *gharar* does not invalidate takaful contracts and they are permissible²¹.

3. Prohibition of *Maisir* (gambling)

One of the criticisms by scholars against conventional insurance is that it contains an element of gambling (*maisir*). While there are differences of opinion in this matter, scholars are in agreement that takaful is free from *maisir*. As takaful is based on mutual aid and contributions are donated for the specific purpose of mutual aid, there is no possibility of loss and all participants’ interests are aligned²².

The fundamental principles of Takaful are widely accepted by Islamic scholars worldwide, including The Islamic Fiqh Academy, the Higher Council of Saudi Ulemas, the Fiqh Council of the World Muslim League, and the First International Conference for the Islamic Economy.²³ In practice, the operational models of various Takaful companies still require regular auditing to ensure compliance with shariah principles.

Takaful operations and issues faced by Takaful operators

From a consumer perspective, Takaful is superior to conventional insurance in several ways. Firstly, it is more cost effective as underwriting surpluses are redistributed among the participants. Moreover, there is a strong emphasis on transparency due to the collaborative nature of Takaful and the added requirement of shariah compliance. Correspondingly, Takaful supports ethical investments and eschews investments that support undesirable industries.

¹⁹ Ayub, 2007. p.421

²⁰ Tolefat and Asutay, 2013. p.16

²¹ Ayub, 2007. p.421

²² Ayub, 2007. p.421

²³ Tolefat and Asutay, 2013. p.11

Finally, for the faithful, it is a shariah-compliant alternative to conventional insurance, one that emphasizes community betterment and mutual assistance.

Despite its benefits and the fact that Muslims form 24% of the global population, Takaful still represents less than 1% of the global insurance market. Adoption of Takaful has been hamstrung by a number of challenges:

1. Inconsistent regulatory environments that inhibit global scaling, resulting in a lack of access for people outside of Muslim countries;
2. Lack of transparency resulting in low consumer trust;
3. Lack of business and operational excellence that make takaful insurance less attractive than conventional insurance.

Challenge 1: Regulatory compliance

An overview of key challenges in the Takaful insurance market by Deloitte's ME Islamic Finance Knowledge Center²⁴ highlighted governance and regulatory compliance as the most significant challenge for Takaful adoption. Typically, starting a Takaful company requires paid up capital of approximately \$20-\$25 million, eliminating the possibility of startups entering the space. Further exacerbating the regulatory environment are the reporting requirements, which take up resources that could otherwise be applied to product development or translate into cheaper prices. As an example, quarterly reporting and analysis of investment portfolios are required in the UAE, these reports have to be prepared by teams of internal accountants and auditors and authenticated by external auditors. In addition to these quarterly reports, annual reports on strategy and processes verified by compliance teams and oversight committees, signed off by boards of directors and externally audited, also need to be filed²⁵. There is no evidence that the amount of human resources that go into reporting produce better results for the Takaful company and its participants.

In Saudi Arabia, the insurance law is further supplemented by "Implementing Regulations" and a battery of 18 other regulations issued by the Saudi Arabian Monetary Agency (SAMA) and 27 "Directives" by the Saudi Central Bank and SAMA²⁶. Each of these regulations number between 15-25 pages, representing over a thousand pages of regulations to comply with. While regulations are important to protect consumers, overly restrictive regulations that are not up to date with market realities can only stifle innovation.

Perhaps the biggest impediment to the growth of Takaful is the lack of standardization in regulatory environments across national borders, resulting in Takaful operators that are limited

²⁴ Deloitte, 2015.

²⁵ [Insurance Authority United Arab Emirates Board of Directors' Decision Number \(26\) of 2014 Pertinent to Financial Regulations for Takaful Insurance Companies](#)

²⁶ Barlow & Alkhliwi, 2010.

to one country at a time. Furthermore, Takaful regulations don't exist in most non-Muslim countries in the world, regardless of the size of the Muslim populations.

To reiterate, regulations are a necessary part of modern societies and some regulation is generally beneficial to consumers. However, the current regulatory environments for Takaful do not allow the industry to scale and to provide access to people outside of a few key countries. In insurance, the law of large numbers prevails; in order to reduce the individual participants' risk, there should be a large number of participants. The failure of Takaful funds to scale is a fundamental impediment to Takaful being a genuine player in the insurance industry.

Challenge 2: Lack of consumer trust

The highly centralized nature of Takaful regulations doesn't account for the original ethos of Takaful, which is founded on mutual aid and cooperation among a community of people. In contrast, in today's Takaful system government regulations centralize control of Takaful operations and funds in the hands of the Takaful operator, taking the community out of the equation. In Takaful funds today, communities are largely divorced from the decision-making process of the funds, mirroring the centralized nature of conventional insurance. While this is an efficient management process, it removes agency from the community and leads to a lack of consumer trust, a fundamental flaw of both takaful and conventional insurance.

The lack of consumer trust further stems from a lack of transparency in Takaful finances and operations. While regulators receive regular reports from Takaful operators, the majority of these reports are not publicly available. As a result, the consumer is left in the dark about how the Takaful fund that partially belongs to her/him is being managed. Unlike conventional insurance, in Takaful, contributions made belong to the fund and the fund in turn belongs to the contributor, who therefore bears the risk of takaful operations. It is therefore not unreasonable for the Takaful participant to demand a certain level of transparency in Takaful finances and operations.

Arguably, the lack of transparency is not intentional from the part of the takaful operator. Up until the invention of the blockchain in the late 2000s and DAOs in the mid 2010s, there haven't been bonafide technologies that would allow Takaful operators to engage in radical transparency without taking on a lot of additional costs. The same cannot be said today as the blockchain has become the third leg in "triple entry" accounting²⁷, a trustless accounting system that enables transparency without additional effort. DAOs and the use of tokens also allows a number of innovations that ensure transparency and engage the community in governance.

Furthermore, Takaful suffers from a branding problem. Most Muslim consumers today, even those who engage in Takaful, don't really understand what it is or how it works²⁸. In truth, Takaful can be seen as a response to conventional insurance and inevitably, it is communicated

²⁷ Cai, 2019

²⁸ Soualhi & Al Shammari, 2015 and many others

as an alternative to such. However, it is time to reframe the narrative and return to the roots of Takaful, with foundations built upon the decentralized technologies of today. We cannot truly have Islamic finance and banking without first disentangling from traditional finance and banking. Likewise, we cannot have true Takaful insurance without first decoupling from the structures of centralized Takaful operations and regulatory environments. For consumers, Takaful on the blockchain will represent a clear break from conventional insurance and its constraints.

Challenge 3: Business and operational excellence

From a consumer perspective, a superior product at a comparable price is always more desirable. Takaful is a product that serves a need like conventional insurance products. However, takaful operations today suffer from a number of business and operational challenges that produce a lackluster customer experience.

We already discussed the high burden of regulatory compliance that increases the costs of Takaful operations and diverts operator attention away from consumers to regulators. We also discussed the lack of transparency and branding problems that plague Takaful. In addition, there is a scarcity of Takaful-trained human resources²⁹ to staff operations, especially in key operations like underwriting, regulatory compliance, shariah, Islamic accounting standards, and most critically, technology. It doesn't help that takaful operators can only source talent from local sources since a globally distributed workforce is still not on the table for most legacy industries.

Distribution of takaful products follows in the footsteps of conventional insurance, through a complex network of agents, brokers, bank partnerships and direct to consumer efforts³⁰. Licensed insurance agents and brokers continue to play the salesman role despite rapid advancements in web2 technologies that have mostly disintermediated middlemen in the way of travel agents. Islamic banks continue to have the most reach when it comes to takaful due to the practice of bundling Islamic financial services together. All this means that distribution is localized and only available within a single nation's borders. A Nigerian cannot buy into an Emirati takaful fund even if the Emirati operator was willing to accept him.

Not unlike the rest of the insurance industry, takaful suffers from a lack of investment in product development and technological transformation. As "software eats the world,"³¹ industries are aggressively taking a software-first approach to re-inventing themselves. Yet, insurtech is in its infancy as insurance incumbents happily use regulatory hurdles as a moat to protect their legacy business from disruption by tech startups.

²⁹ Saeed, Maryam, 2019.

³⁰ Eddine, Fatima, 2013.

³¹ A concept coined by Marc Andreessen

All of this means that takaful is poised to flourish if the right ingredients are added. Building upon the web3 foundation, TAKADAO will reduce regulatory compliance burdens, bring transparency into takaful operations and take a technology-first approach to building a trustless community organized for mutual aid.

03 - TAKADAO: Takaful as a DAO

Blockchain from a Shariah perspective

Web3, blockchain, cryptocurrencies, DeFi, NFTs, DAOs are all technologies that are evolving rapidly. Islamic scholars, like government regulators, are having a hard time catching up. It is clear to scholars that the distributed ledger technology, aka the blockchain, in and of itself is neutral and is not objectionable from a shariah perspective. In fact, the distributed nature of the blockchain has been compared to the preservation of the Quran, the nodes in a network being the memorizers of Quran. For someone to claim that a single verse of the Quran is incorrect would mean challenging the memory of many millions of people who have memorized the Quran. Similarly, to change anything on the blockchain would require 51% consensus of all the nodes.

While blockchain technology is innocuous, the same cannot be said about the various projects that run on the blockchain. Scholars are unequivocal that each project should be analyzed against shariah principles before participation.

For those building on the blockchain, the same prohibitive nature of the shariah applies, anything that is not specifically prohibited is allowed. This means that there should be a careful and deliberate focus on avoiding the impermissible to stay shariah compliant. This is the approach by which TAKADAO is built.

TAKADAO is built on a number of blockchain technologies that require consideration.

- Decentralized Autonomous Organizations (DAOs)
- Cryptocurrencies and stablecoins
- Tokenization and NFTs
- Smart contracts and oracles

The DAO in TAKADAO stands for Decentralized Autonomous Organization. Essentially, it's a group of people coming together for a specific purpose. To do this in the off-chain world, people would incorporate a legal entity (a company) with a set of bylaws enforced through a nation's

courts. A DAO on the blockchain is organized by smart contracts: computer code that is immutable and that ensures that whatever needs to happen, happens. Smart contracts are both the bylaws and the enforcers of the bylaws.

To represent membership and ownership of the DAO, DAO tokens are issued. Suppose the DAO is financial in nature, participants would contribute cryptocurrencies such as stablecoins to the DAO and receive DAO tokens in exchange. The type of cryptocurrency accepted and how many tokens will be issued by the DAO are determined at the time of DAO creation and coded into smart contracts.

Smart contracts control and regulate the behavior of the DAO, including how financial assets are managed. In most cases, what action a smart contract takes requires additional information that may be dynamic in nature and require constant updates. In such cases, data oracles are called upon by the smart contracts to provide this information. Oracles can be machine or human and their impact on the smart contract is limited to the data they provide.

Assets on the blockchain are either fungible (many identical units) or non-fungible (one unique item). Fungible tokens (like DAO tokens or bitcoin) are indistinguishable from one another, while Non-fungible Tokens (NFTs) are unique and no more than one of each exists. NFTs are a useful way to bring physical real world assets on-chain and can be locked into smart contracts.

The above technologies form the basis of TAKADAO, none of which are inherently prohibited by shariah. Of course, that alone does not make TAKADAO shariah-compliant, what TAKADAO does also requires further examination, which will be covered in the rest of this paper.

Addressing the problems of Takaful today: Blockchain to the rescue

To address the challenges faced by the Takaful industry, we propose the adoption of the blockchain and cryptocurrencies as the solution.

Today, people in non-Muslim countries as well as in many Muslim countries don't have access to conventional insurance, let alone Takaful products. Considering that Takaful is community-based mutual insurance, why this is the case is not clear to us. People should be able to come together and contribute to a takaful fund that is professionally managed. Organizing as a DAO allows this to happen.

We talked about the law of large numbers to reduce individual participants' risk; what better way to do this than to gather a global community contributing to a takaful DAO fund? Furthermore, the DAO is far superior than a real world company in that it is governed by auditable smart contracts that cannot be changed by any one person. This allows a "trustless" entity, one that doesn't require a centralized authority like national courts or police to enforce. Smart contracts are computer code that don't have biases or fears and don't make decisions based on emotions.

Accepting takaful contributions via cryptocurrencies eliminates the high costs of moving fiat money across borders; for many people in countries with highly inflationary currencies, cryptocurrencies also help keep takaful contributions, and more importantly the takaful benefit, regular and predictable. How much is a life insurance benefit really worth if the payout currency is depreciating 10-20% a year? By the time your beneficiaries receive a payout in fiat currency, that amount may be worth the same or less than just keeping the premiums in cash to begin with.

The public nature of the blockchain is a boon for regulators who now have “externally audited” financial transaction data at their disposal at all times. The blockchain forms the third leg in “triple entry” accounting, reducing the significant effort currently devoted to internal and external auditing. Furthermore, underwriting and treasury management strategies are all easily auditable through smart contract “audits”; for example, a simple read through of a smart contract will reveal the variables that impact claims and how claims processing is executed. Needless to say, this is easy on regulators and great for consumer trust.

The issuance of DAO tokens to participants is yet another unparalleled innovation in takaful fund management. Recall that the takaful fund is ultimately owned by the contributors to the fund. You can compare this to a company with investors. Traditionally, keeping track of investors through cap table management is a job in itself involving spreadsheets and a lot of paperwork. This is compounded in a takaful fund when contributors are moving in and out of the fund regularly according to insurance contract validity dates. The issuance of DAO tokens streamlines this process as tokens represent ownership in the takaful fund and are digitally tracked on the blockchain, reducing human error and fraud.

The DAO token allows for yet another important function currently absent in takaful: community governance. Tokens represent ownership as well as voting power. DAO participants can now vote in a fair and transparent manner on key issues in takaful fund management, such as the selection of the takaful operator or treasury manager.

A lack of appropriately trained talent is no longer an impediment now that a globally distributed workforce is available for web3 companies. COVID has not only shown that remote work is possible, it also is associated with productivity increases³². In any event, a globally distributed team is necessary for a project that requires appropriately trained workers difficult to gather in a single locale.

It is our goal to apply a technology-first approach to building insurance products of the future. Building takaful as a DAO is just the first step that unlocks product innovation and advancement in an industry that rarely even tries. The very premise of a decentralized, global, insurance fund is in and of itself innovative and presumes to de-risk through scale, resulting in better outcomes for all parties involved. And yet, there will surely be more innovation and unlocks ahead.

³² <https://www.apollotechnical.com/statistics-on-remote-workers>

TAKADAO vs. Takaful

TAKADAO is a response to challenges faced by the takaful industry, the same challenges that have inhibited global scaling and have resulted in large numbers of underinsured Muslims worldwide. Our mission at TAKADAO is to provide:

- Global access to shariah-compliant insurance through the use of public blockchains and cryptocurrencies
- Transparency, trust and community engagement by establishing true ownership of the takaful fund by participants in the form of a DAO as a sovereign self-governing entity
- Better outcomes for all participants and stakeholders

To achieve these goals, TAKADAO builds on Takaful fundamentals with several added features:

- Strict separation between funds owned and controlled by the takaful operator (herein known as the “Operator fund”) and funds owned and controlled by the participants (herein known as the “DAO fund”). Each fund is owned and controlled by separate legal entities that have separate governance structures.
- The conventional “sum assured” is now a “benefit multiplier” to derisk the DAO fund and to ensure solvency. In simple terms, the benefit in the event of a claim is based on the amount contributed to the DAO fund and the individual risk. In conventional insurance, only individual risk matters in claims calculations, the amount contributed doesn’t factor into the claim.
- The “benefit multiplier”, which determines claims amount, will vary in a given range, based on the performance of the DAO fund. If the fund performs well, the benefit multiplier (and claim amount) increases, if the fund performs badly, the benefit multiplier decreases.
- The distribution of the underwriting surplus is “on-demand” (subject to lock-up periods) as opposed to being tied to the fiscal year end.

	TAKADAO	Traditional Takaful
Legal entities	<p><i>2 separate legal entities.</i></p> <ol style="list-style-type: none"> <i>1. Takaful operator that owns and manages funds generated from management fees</i> <i>2. DAO entity that owns</i> 	<p><i>The takaful operator is the single legal entity that manages all funds. Funds are accounted for separately, but are held and managed by the same entity. Participants</i></p>

	<p><i>and manages funds generated from participants' contributions. Funds are held in the name of the DAO entity. The DAO entity may appoint treasury managers to manage funds on their behalf.</i></p>	<p><i>have no say in who manages the funds.</i></p>
<p>Participants</p>	<p><i>Participants are owners of the DAO fund and are known to one another. Their ownership and equity stake is represented by DAO tokens.</i></p> <p><i>DAO governance by participants is engaged in through voting, one token, one vote.</i></p>	<p><i>In theory, participants are the owners of the takaful risk fund, but in practice, they have no legal right nor access to the monies in takaful risk fund</i></p>
<p>Board of Directors</p>	<p><i>Board of directors of the DAO fund is selected from participants and voted in by participants. They represent the interests of the DAO fund solely. They are not to be confused with the board of directors of the Takaful operator.</i></p>	<p><i>The participants are not represented by an independent board of directors. The board of directors of the takaful operator represents the interests of both the takaful operator and participants.</i></p>
<p>Benefit amount in the event of a claim (for life insurance)</p>	<p><i>The participant/insured is assigned a benefit multiplier at the initial underwriting of the policy. To determine the actual benefit amount, the total contributions are multiplied by the benefit multiplier. The more contributions are made, the larger the benefit amount.</i></p>	<p><i>The participant/insured is guaranteed a certain "sum assured" in the event of a claim. This sum assured is determined at the initial underwriting of the policy and is not conditional on a certain amount of contributions being made. If someone makes 1 month of contributions, he will be paid the same sum assured as someone who makes 48 months of contributions.</i></p>
<p>Fixed vs variable benefit</p>	<p><i>The benefit amount varies within a stated range according to the performance</i></p>	<p><i>The sum assured stays the same no matter the performance of the fund.</i></p>

	<i>of the DAO fund. In case fund performance is better than projected, benefit amounts increase and vice versa.</i>	
Distribution of underwriting surplus	<p><i>Real-time tracking of the underwriting surplus with redemptions “on-demand”. Unstaked tokens (i.e. the underlying insurance contract has expired) can be redeemed for the underwriting surplus, tokens are then burned.</i></p> <p><i>In case of underwriting deficit, the takaful operator provides a no-interest “qard hasan” loan to the DAO fund. The loan should be repaid in subsequent years when an underwriting surplus is realized.</i></p>	<p><i>Declared at the discretion of the takaful operator and usually at the end of the fiscal year end.</i></p> <p><i>In case of underwriting deficit, the takaful operator provides a no-interest “qard hasan” loan to the takaful risk fund. The loan should be repaid in subsequent years when an underwriting surplus is realized.</i></p>
Regulatory regime	<p><i>The takaful operator is regulated as a for-profit entity providing consulting and technical services to the DAO fund.</i></p> <p><i>The DAO fund is regulated as a non-profit association or foundation engaged in a risk-sharing pool. Participants are protected from personal liability.</i></p>	<i>The takaful operator is regulated as an insurance company engaged in risk-transfer insurance contracts.</i>

Two Funds, Two Entities

A key differentiator between TAKADAO and traditional takaful operators is that there are two independent entities to consider. In the case of traditional takaful operators, there is only one entity, the takaful operator, who represents both themselves and the participants of the takaful risk fund. The traditional takaful operator owns and manages all the monies from contributions and participants have no legal authority to take part in the management of the takaful risk fund.

In the case of TAKADAO, the DAO fund is an independent entity that is owned and managed by the participants. The takaful operator is a separate entity that works for the DAO entity as a service provider. Equity in the DAO fund is based on token ownership. If an individual owns tokens of the DAO, then he is part owner of the DAO. In the same way, if an individual owns shares in a company, he is part owner of the company.

To represent their interests, the DAO elects a board of directors from among its members. DAO members cast votes with each token representing one vote. The DAO directors are responsible for screening proposals that are subsequently put to a vote by the DAO members. In case there are insufficient votes to reach quorum, then the DAO directors may vote on behalf of the DAO members.

The monies generated by token sales are owned by the DAO entity and held in the name of the DAO entity. This means the DAO entity is legally the owner of these monies. The DAO entity may then appoint the takaful operator to manage the monies on their behalf. By the same token, the DAO entity may fire the takaful operator in case of non-performance or some other breach of contract.

By extension, the underwriting surplus, which is the monies left over in the fund after claims are paid and investment returns realized, is owned by the DAO entity. DAO members have a legal right to these monies which they can claim according to predefined rules agreed upon by the DAO.

Because the DAO entity bears all the risk and reward of insurance activities, it is considered a risk-sharing arrangement. As such, it is not regulated as a traditional insurance company as insurance contracts are defined as risk-transfer contracts. Instead, the DAO entity is regulated as a non-profit organization or reciprocal “self-insurance” company where such legal structures exist. Recall that as per shariah requirements, the contributions are considered donations for a specific purpose. In addition, the nature of insurance means that claims will always outpace investment returns, so participants of the DAO fund cannot reasonably expect a profit. Hence the use case perfectly fits that of a non-profit organization.

On the other hand, the takaful operator is a for-profit entity that acts as a service provider to the DAO fund. The takaful operator is engaged by the DAO fund and manages the underwriting and technology functions on behalf of the DAO fund. The takaful operator serves at the pleasure of the DAO fund.

Risk, Solvency and the Benefit Multiplier

Another key point of discussion is the claims benefit payout. The structure of the benefit payouts are designed to de-risk the DAO fund and ensure ongoing solvency by pegging the benefit payouts to contributions and fund performance. Adjusting for individual underwriting risk, the more an individual contributes, the larger his benefit payout. The better the fund performs, the

higher the benefit payout and vice versa. The key point is that all risk and reward accrue to the DAO fund only and not the takaful operator. Hence the objective of all underwriting and risk management activities is to prolong the life of the DAO fund and ensure solvency.

In conventional life insurance, the policyholder is promised a sum assured regardless of how much he has paid in premiums. As long as the insurance policy is in force and his claim is approved, he is guaranteed to receive that amount no matter where in the lifecycle of the policy he is. He could have made only a single monthly premium payment and he will still receive the same benefit payout as if he had made 5 years of payments. This goes back to the concept of risk transfer as the insured has now effectively transferred all the risk to the insurer and hence the insured is not entitled to any of the benefit or underwriting surplus. In a risk-sharing model like TAKADAO, instead of a sum assured, we determine claims benefit payouts using a benefit multiplier.

At the time of underwriting prior to a policy being issued, an individual is first rated based on his individual risk. For life insurance, the rating will depend on age, residence, occupation and lifestyle, among other factors. The better the rating, the lower the risk and the higher the ensuing benefit multiplier. The rating schemes are determined by mortality rates and actuarial risk analyses.

As an example, a 25 year old non-smoker living in a Western country and working in a low stress office environment may be assigned a benefit multiplier of 150x.

In the event of death, the benefit amount will be determined by the total contributions paid by the insured multiplied by the benefit multiplier.

Continuing the example, the 25-year old insured makes monthly contributions of \$15 for 2.5 years, totaling \$450. He passes away and his family is entitled to a claim benefit of $\$450 \times 150 = \$67,500$. If instead, he had made monthly contributions for 5 years, totaling \$900, the benefit amount would raise to $\$900 \times 150 = \$135,000$.

The primary reasons for using a benefit multiplier instead of a sum assured are to ensure equity among participants and to de-risk the fund to prolong solvency. Recall that all underwriting surplus is redistributed among the fund participants, so everyone benefits from a de-risked fund.

To further de-risk the fund, the benefit multiplier fluctuates within an expected range, according to the performance of the DAO fund. In any insurance-type product, there is an expected amount of losses that are incurred from claims, called the "loss ratio". The loss ratio is based on the amount of risk that is taken on as a result of the underwriting process. In simple terms, if all of the policies are insuring senior citizens, the loss ratio is expected to be higher than if all the policies are insuring young healthy adults.

Benchmarking against historical data, we have underwriting models that project an expected loss ratio of the DAO fund. The assigned benefit multipliers are based on these expected loss

ratios. In case reality does not match history, the benefit multipliers will be adjusted up or down within a given range.

In our example, the anticipated loss ratio for the DAO fund is 40%. In simple terms, that means we expect 40% of all contributions to be spent paying claims. Based on this loss ratio, our 25-year old insured is assigned a benefit multiplier of 150x. In the event that the loss ratio is increased significantly to 50%, an adjustment downward will be made to the benefit multipliers of all who are currently insured. The adjustment will be equivalent to the amount necessary to restore the financial outflows to expected amounts, in order to keep the DAO fund solvent. A deeper discussion of how these amounts are determined can be found in later sections of this whitepaper.

These adjustments are not arbitrary and are based on published financial models and also coded into smart contracts that are open source and publicly auditable. The solvency of the DAO fund (which results in the ability to honor all claims) is always the ultimate goal of all underwriting and financial decisions undertaken by the takaful operator. Furthermore, the actions of the takaful operator are overseen by the independent board of directors that represents the DAO fund. More on DAO governance can be found in later sections of this whitepaper.

PART TWO

04 - Dynamic Underwriting and risk management

Takadao represents a departure from existing Takaful products in the following ways.

- Absence of external capital providers
- Absence of retakaful or reinsurance providers
- Global fund with no historical data

Absence of capital providers

Because the DAO fund is fully community-owned, there are no external capital providers. Typically, external capital providers (such as the takaful operators and their investors) provide capital to an insurance fund not for the purposes of being insured, but as an investment that will yield a profit. Hence external capital providers will share in the underwriting surplus along with the takaful operator and participants. External capital providers are most important in the early years of the fund when the fund is small and contributions alone may not be sufficient to cover claims that have a defined benefit.

Imagine a scenario where in the first month of fund inception, there are 100 participants who have paid in \$100 each. The fund will have total contributions of \$10,000. Suppose one of the participants makes a successful claim for a sum assured (defined benefit) of \$100,000, then the fund is wiped out. Having external capital at this time will be very useful to maintain the capital needed to keep the fund going.

The down side of introducing external capital is that it reintroduces the zero sum profit motive that pits insurance companies against their customers, the insured. In this case, capital providers will not look favorably upon claims being paid as this will directly reduce the underwriting surplus, and therefore reduce their profit.

Takadao's DAO fund is structured to operate without external capital providers. To avoid a scenario where the fund is wiped out by claims, Takadao will apply dynamic underwriting that adjusts the benefit multiplier (introduced in the previous section) according to the performance of the fund.

Back to the example of 100 participants in month 1 of the fund, who have paid in \$100 each. The fund has a total contribution of \$10,000. Participant Q makes a successful claim. Having a claim in month 1 in a fund with only 100 participants is highly unusual and generally not predicted in actuarial models, which means that the fund has performed poorly. Based on initial

underwriting, Participant Q had an individual risk profile that allocated to him a Base Benefit Multiplier (B.BM) of 100x. However, due to the poor performance of the fund, the B.BM for all participants is adjusted downward. A Benefit Multiplier Adjuster (B.M.A) of 0.5x* is therefore applied to all base benefit multipliers for all outstanding claims. Participant Q's claim is therefore paid out at \$100 (his initial contribution) x 100 (his B.BM) x 0.5 (portfolio B.M.A) = \$5,000³³.

**Important: the numbers in this example are used for illustrative purposes only and are not actual.*

Note that such a scenario is extreme and is only likely in the early days of the fund when capital is low. As the fund matures and the number of participants increases, the risk is spread out among many more participants and hence the individual impact is lower. The older and larger the fund is, the lower the individual impact of poor fund performance.

On the flip side, if the fund performance is better than expected, the B.M.A will be greater than 1x and individual claims payouts will increase. This goes back to the fundamental principle of risk sharing where both losses and rewards are shared.

Another important point to note is that claims payouts will not fluctuate wildly based on market conditions. Monies allocated for investments will make up a minority portion of the total capital in the fund, the majority of the fund being allocated to capital reserves that are maintained for claims payouts. The major factor that causes fluctuations in fund performance, and therefore claims payouts, are related to mortality rates, which tend to be stable over a long enough period of time. Outside of catastrophic events, mortality rates tend to be stable or slightly improve over time, which limits fluctuations.

Given the global nature of Takadao, catastrophic events in a single country or territory will affect the Takadao fund less than a national insurance fund. For example, an earthquake in a single country will likely wipe out the insurance funds in that country as all the risk is concentrated in that geographic location. With Takadao, risk is spread out globally, so a catastrophic event in a single country will have less impact on Takadao than a national insurance fund.

Absence of retakaful or reinsurance providers

How do national insurance funds correct for the risk of catastrophic events? They do this through reinsurance. Insurance companies engage reinsurance companies to insure the risk of the insurance company. Look at this as yet another layer of capital providers; the difference is, the reinsurers don't provide the capital up front, they only provide it when the fund runs out of money. And unlike capital providers, there is no defined amount of capital that the reinsurer should provide, it just depends on the capital needs of the fund in a catastrophic event.

³³ More explanation on this will follow

Takaful companies also have a similar retakaful set-up, although the market for retakaful has struggled in recent years and many takaful operators turn to conventional reinsurance companies for reinsurance coverage. The shariah position on this is unfavorable.

The Takadao DAO fund will seek retakaful coverage, however, as crypto regulations are still unclear in much of the world, retakaful companies may not be willing to extend coverage. Hence, as with capital providers, the DAO fund is structured to operate without retakaful coverage. As explained above, dynamic underwriting is employed to ensure that the fund will remain sustainable in the long run.

Global fund with no historical data

Takadao's mission is to provide the global underinsured with access to fair and transparent takaful insurance. From an insurance perspective, a global fund is highly diversified and will benefit from lower overall risk. However, the downside to a global fund is that it hasn't been done at scale before and hence there isn't enough historical data to underwrite and predict the risk to a high confidence level.

Takadao will amalgamate data from national sources in its prediction and underwriting models and use machine learning to adapt the models continuously; however, with any new innovation, there will be a learning curve. Additionally, it may be difficult to get up to date data sources, especially from nations where data is not readily available.

Here, dynamic underwriting once again addresses the issue of fund solvency.

Dynamic underwriting (aka Takawriting): A closer look

Conventional life insurance underwriting starts from the concept of a sum assured. The insured is guaranteed a fixed amount of money upon a successful claim. The insurance company guarantees that this money is paid regardless of the solvency of the fund, this represents a transfer of risk from the insured to the insurance company. As a result, the insurance company gets to keep 100% of the insurance premiums regardless of how much is actually spent on claims payouts.

Working from the starting point of the sum assured, underwriting seeks to price insurance policies correctly based on the risk of each individual. If the policies and risk are priced correctly, the premiums collected should more than cover the claims payouts, resulting in an underwriting surplus. Additionally, even more surpluses can be generated by investing part of the premiums that are collected. The underwriting surplus is then the profit of the insurance company who shares it with their investors (external capital providers) and reinsurers.

To say that this model benefits the insurance company is an understatement; insurance companies control vast amounts of wealth globally. In 2021, the assets of insurance companies globally amounted to approximately 40.6 trillion³⁴ U.S. dollars - an increase of almost two trillion U.S. dollars from the previous year and almost double the annual GDP of the United States.

Based on the sum assured, the insured pays a defined premium for his insurance coverage. If the insured defaults on his payment, he may be charged a late fee and eventually his policy is canceled, regardless of how much he had already paid in premiums previously. In this risk transfer model, the insured receives nothing if a claim is not made or is unsuccessful. Additionally, the insured would have lost all of the premiums that were paid to the insurance company.

In Takadao's dynamic underwriting model, hereby referred to as Takawriting, the benefit, or claims payout is not strictly defined. It is not a sum assured. Instead the model starts by determining a targeted loss ratio and underwriting surplus and works backwards to determine the benefit amount based on the amount that was contributed by the insured and his individual risk. Recall that the underwriting surplus is then redistributed back to the insured members who have not received a claim.

In this risk sharing model, the ultimate goal is continued fund solvency. The worst thing that can happen to a risk sharing insurance fund is that the fund runs out of money and is discontinued. This would mean a total loss for all the insured who would lose their insurance coverage and all their contributions as well. Hence, dynamic underwriting is applied to prevent this scenario by adjusting benefit amounts to maintain fund solvency.

The following table highlights the key differences between Takadao and conventional insurance and takaful products from the perspective of underwriting approaches.

	TAKADAO	Conventional Insurance & Traditional Takaful
Benefit (Claim payout)	Undefined, benefit multiplier	Defined, sum assured.
Contributions/Premiums	Flexible	Fixed
Defaults	Reduces benefit multiplier, insurance coverage maintained	Results in late fees and policy cancellations
Underwriting Surplus	Fixed target. Is redistributed among participants/insured	Variable. Is profit for insurance company and shared with capital providers and reinsurers

³⁴ <https://www.statista.com/statistics/421217/assets-of-global-insurance-companies>

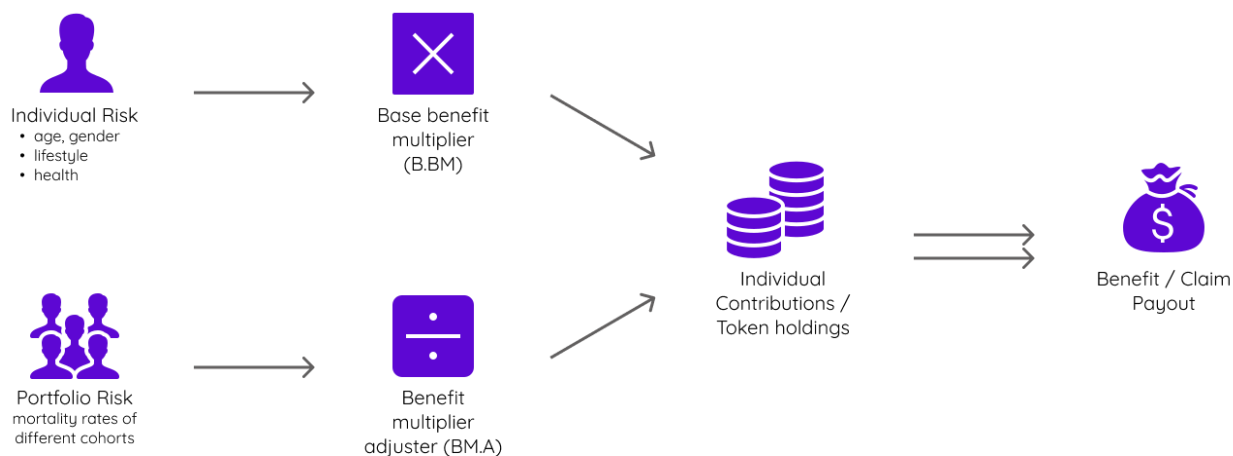
Underwriting Deficit	Fixed target. Is shared among participants/insured	Variable. Is loss for insurance company and shared with capital providers and reinsurers
Loss ratios exceed expectations	Benefit multiplier reduced for all claims, maintaining the targeted underwriting surplus for participants	No change in sum assured, reduces underwriting surplus/profit of insurance company
Loss ratios lower than expectations	Benefit multiplier increased for all claims, maintaining targeted underwriting surplus for participants	No change in sum assured, increases underwriting surplus/profit of insurance company

Risk and the Benefit Multiplier (BM)

There are two categories of risk that affect a claim payout, individual risk and portfolio risk. From a customer's perspective, consider individual risk as being the risk of I, the customer, passing away; and portfolio risk as the risk of other people passing away.

The benefit payout in the event of a successful claim is calculated as follows:

$$\text{Benefit payout} = \text{Base Benefit Multiplier (B.BM)} \times \text{Benefit Multiplier Adjuster (B.M.A)} \times \text{Individual Contributions (Token holdings)}$$



Individual risk and the Base Benefit Multiplier (B.BM)

Individual mortality risk is based on an individual's risk profile. Variables³⁵ that measure individual risk include the following:

- Age
- Gender
- Country of residence
- Occupation
- Health (BMI)
- Lifestyle

The outcome of an individual risk assessment is the Base Benefit Multiplier (B.BM). Each individual is assigned a B.BM and the B.BM is re-evaluated yearly to account for changes in age and lifestyle. The B.BM is the first variable of the equation that is used to determine the benefit that will be paid out in the event of a successful claim.

Portfolio risk and the Benefit Multiplier Adjuster (BM.A)

As a standard risk management practice, insurance funds use mortality rates and actuarial tables to estimate the loss ratios (the amount of money paid out in claims) that a fund will expect to experience. Based on expected loss ratios, financial projections are drawn up and insurance policies are priced. As discussed previously, this static "lookback"³⁶ approach is risky for the Takadao DAO fund and may result in fund insolvency. Instead Takadao will measure loss ratios in real time and adjust benefit payouts (by adjusting the benefit multipliers) to ensure that the targeted loss ratio is maintained and the fund remains solvent.

Portfolio loss ratios are dependent on the following variables³⁷:

- The composition of individuals in the fund (i.e. a fund that has only 30 year olds will have a lower loss ratio than a fund with only 65 year olds).
- The overall risk of the fund based on the composition of individuals in the fund.
- External events that impact a significant number of individuals in a fund (i.e. an earthquake, a pandemic, wars)

At any given time, there is a balance between the loss ratios and benefit payouts that optimize for the solvency of the fund. In case the loss ratios become too high to threaten the fund solvency, the benefit payouts will be reduced to bring the loss ratios back to the desired level. In the event that loss ratios are lower than expected, meaning the fund is performing better than expected, then benefit payouts and underwriting surplus are increased, benefiting all members of the fund.

³⁵ This is a non-exhaustive list of variables

³⁶ Insurance companies price insurance policies for the coming year, but "looking back" to the results of the previous year. The alternative is to apply predictive pricing.

³⁷ This is a non-exhaustive list of variables

(INSERT DIAGRAM)

The main concern of an adjustable benefit multiplier is whether it's fair for the beneficiary of a claim. Will there be a scenario where a beneficiary will not receive a payout or that that payout is so low as to defeat the purpose of having insurance to begin with? In fact, dynamic underwriting was designed precisely to avoid these scenarios. Firstly, dynamic underwriting sets as its goal fund solvency, which means that there should not be a scenario where a beneficiary does not receive a payout. Secondly, the model shares the risk among many people, which means that if the loss ratios result in lower benefit payouts, the decrease is shared among many so that not one single individual will be disproportionately impacted. Furthermore, the increased underwriting surplus that results from lower than expected loss ratios are banked for subsequent years, which reduces fluctuations of the fund and enhances solvency.

Takawriting and its impact on the insured

Takadao's most important role is to ensure that its members are protected and benefit from mutual aid and assistance in times of adversity. To achieve this, every design and operational decision must be carefully considered against cost and benefit to the DAO membership. Likewise, the impact of Takawriting on DAO membership must be carefully considered.

Impact 1: Long term solvency of the fund

Takawriting optimizes for the long term solvency of the DAO fund. Everything is oriented around the goal that the fund should remain solvent in perpetuity and therefore be able to pay claims in perpetuity. If the fund becomes insolvent because it paid out too much in claims, then the minority who received benefit payouts earlier would have benefited, but the majority of participants would be harmed as an insolvent fund would neither be able to pay future claims nor distribute underwriting surplus. Hence Takawriting will ensure the greatest benefit for the largest number of people.

In a healthy life insurance fund, less than 1% of the insured is expected to pass away in a given year. This means that 99% of the insured population will not make a claim. However, with a longer time horizon, everyone will pass away and everyone should be able to make a claim and receive a benefit. This is why fund solvency in perpetuity is the ultimate objective.

Impact 2: Perpetual life insurance

Takawriting allows us to operate a life insurance fund in perpetuity without the need to focus on short term profits. This also means that we can offer life insurance in perpetuity and at a much lower cost than conventional "whole life" insurance. We are able to do this because the fund is managed to ensure solvency in perpetuity.

Impact 3: Uncertainty in benefit payout amounts

Takawriting, unlike conventional insurance underwriting, does not have a sum assured and the benefit multiplier is impacted by loss ratios. This means that there is some uncertainty in what a beneficiary will receive in the event that the insured passes away. For some, this defeats the purpose of insurance altogether. Putting things into perspective, the undefined benefit is common in conventional auto and medical insurance where the benefit payout depends on the expense incurred as a result of a car accident or medical condition. In addition, there are usually limits put on benefit amounts and a deductible which the insured pays. As such, the practice of the undefined benefit in insurance is not new. What is new is its application to life insurance. However, individual impact should be limited due to the risk sharing nature of the fund where losses are spread among many instead of borne by a single person. In addition, as benefit payouts are a multiplier of an individual's contributions, the minimum benefit payout that can be received will equal that individual's contribution. In the event of a claim, the beneficiary will receive at least what was paid in.

Impact 4: Participation in underwriting surplus (affordability and fairness)

Trade Offs

Dynamic underwriting and the need for transparency

TAKADAO Tokenomics and Membership

One of the most exciting use cases of the blockchain is the ability to create tokens that have value and whose transfers are tracked and immutable. The TAKADAO ecosystem's native token, the TAKA token underpins all the financial operations of the DAO fund, which allows for unprecedented transparency and governance over all financial transactions. This section describes the functionalities of the TAKA token.

Purchase tokens, become a member

In order to become a member of the DAO, an individual should purchase TAKA tokens. At issuance, the token price is pegged 1:1 to USDC³⁸; in other words, 1USDC added to the DAO fund will result in 1 newly minted token. The TAKA token is only issued when new money is added into the DAO fund; tokens are not pre-mined.

TAKADAO the company will receive management/wakala fees of 25% on all funds contributed to the DAO fund. As such, for every 1USDC that is paid by a participant, 0.25USDC will be

³⁸ USDC can be substituted with any other collateralized stablecoin, such as USDT or DAI.

given to TAKADAO and 0.75USDC will be added to the DAO fund, resulting in 0.75 TAKA being minted.

It should be noted that the TAKADAO management fee is the only fee that the company will take, there are no other fees and the company does not share in the underwriting surplus except with the express permission of DAO participants.

As was previously stated, token value at minting is pegged 1:1 TAKA to USDC. Post issuance, token value is pegged to the value of the assets held by the DAO fund. To determine token value at redemption, take the value of the assets in the DAO fund divided by total number of outstanding tokens. For example, if the DAO fund has 1,000USDC worth of assets and there are 500 outstanding TAKA tokens, then each TAKA = $1,000\text{USDC} / 500 = 2\text{USDC}$.

The token value at minting and the token value redemption are different for functional reasons as will become clear in the rest of this document.

Once an individual has purchased TAKAs, he/she is now a member of the DAO fund and may participate in governance voting and be entitled to a share of the underwriting surpluses of the fund. However, in order to get insurance coverage, the member will need to stake their tokens in an insurance contract.

Stake a token, create an insurance contract

In order to obtain insurance coverage, the member would stake his/her token into an insurance smart contract that defines the parameters of the coverage, including the benefit multiplier assigned to the member. The TAKAs are staked, meaning they are locked up in the contract, for the duration of the insurance contract, i.e. 1, 5, 10, 20 years. When the TAKAs are locked up, they cannot be withdrawn out of the smart contract and so they cannot be traded nor redeemed. As long as the TAKAs stay staked, the insurance coverage is in force.

Upon insurance contract maturity and assuming no claims were made and no insurance benefits paid out, the staked TAKAs will be unstaked and released to the member, free to be withdrawn and transferred. Once the TAKAs are unstaked, the insurance coverage terminates. At this point, the member may:

- restake his/her TAKAs in a new insurance contract
- withdraw/transfer his/her TAKAs out of the smart contract to be traded or stored
- redeem his/her TAKAs against his/her share of the underwriting surplus as described in the next section

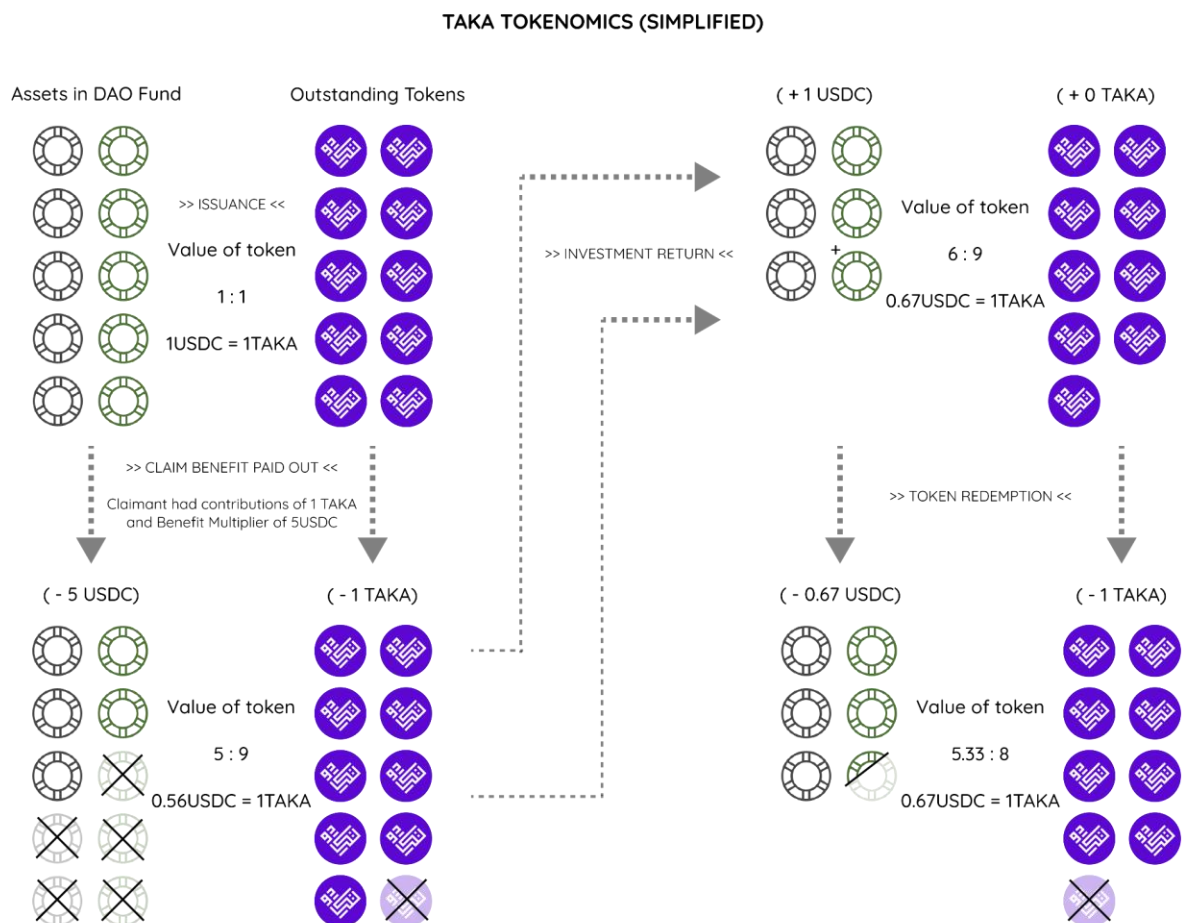
Redeem/burn tokens, exit the DAO

Tokens determine the value of the Underwriting Surplus (UWS)

Unstaked tokens can be redeemed by members against their share of the underwriting surplus which is equivalent to the value of the token.

Recall that the value of the token is pegged to the value of the digital assets in the DAO fund. Recall also that the underwriting surplus are the assets left over after claims and expenses and paid and investment returns realized. Hence the underwriting surplus at any given point in time is equal to the digital assets held by the DAO fund (which do not include reserves for insurance losses that have occurred, but yet unpaid). As such, whenever a token is redeemed, it is equivalent to a member cashing out his share of the underwriting surplus.

Once a token is redeemed, digital assets equivalent to the token value is transferred out of the DAO fund to the token owner and the token is burned or destroyed. This ensures that the remaining tokens maintain their value and are not affected by the reduction in overall assets.



Tokens determine insurance benefit

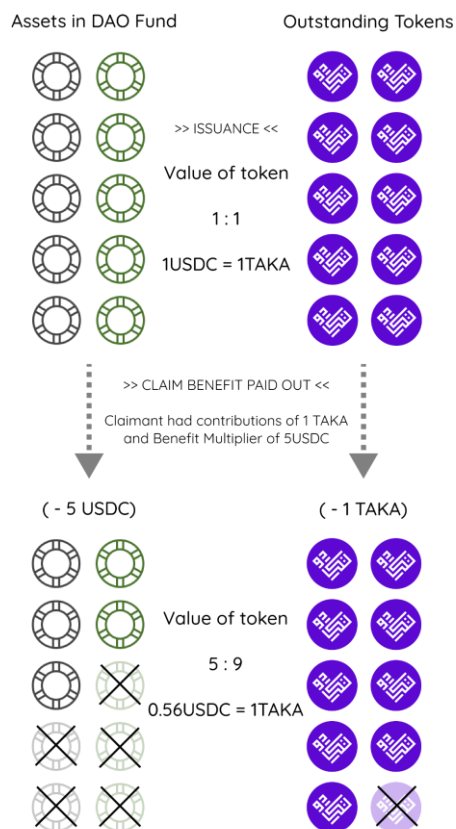
TL;DR:

- *Tokens = contributions*
- *Benefit = tokens x B.BM x BM.A*
- *Tokens burned once claim is paid, other tokens decrease in value*
- *The decrease in value of tokens represents the cost of coverage*

In the event of a successful insurance claim, the benefit is determined by an individual's token holdings and assigned benefit multiplier (see previous [section](#)).

$$\text{Benefit payout} = \text{Base Benefit Multiplier (B.BM)} \times \text{Benefit Multiplier Adjuster (BM.A)} \times \text{Individual Contributions (Token holdings)}$$

The benefit payout is paid from the digital assets held in the DAO fund which will reduce the overall holdings of assets in the DAO fund. Tokens will also be burned as part of this transaction, however, they are not burned in the corresponding amount; instead, the entire token holdings of the member making the claim will be burned³⁹.



Example:

At the time of issuance or minting, 10 USDC is added to the DAO fund and 10 TAKA tokens are minted and issued to members who purchased the tokens.

The DAO fund now has 10 USDC and there is 10 TAKA outstanding which implies a value of 1TAKA = 1USDC.

A successful claim is made by a member who has 1 TAKA and has been assigned a benefit multiplier of 5x or 5 USDC. The benefit payout amount is therefore 1TAKA x 5USDC = 5USDC.

5 USDC is transferred out of the DAO fund to the beneficiary and 1 TAKA is burned. After recalibration, there is now 5 USDC for 9 outstanding tokens which implies a value of 1TAKA = 0.56USDC.

This example assumes that there are no additional tokens minted and there are no investment returns or token redemptions.

The example above shows the change in value of the token in the event of a claim. It should be clear that the token value decreases for all members in the event of a claim. If a member

³⁹ This is assuming that the value of the tokens burned is less than the benefit payout amount.

chooses to cash his/her underwriting surplus out now by redeeming his/her token, it will be less in value than at mint. This reduction in value represents the cost of his/her insurance coverage for the period from first mint till the time of redemption.

To be continued...

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