Blockchain: gambling tax - automated and transparent payment to the tax authority with the use of smart contracts

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Index

1. Introduction

Gambling on the internet is problematic from a regulation perspective. Tax authorities aren't in the position to keep track of cash flows within online gambling. Regulators in The Netherlands have forbidden all online gambling besides Toto and Runnerz.[1] Therefore the platforms are servicing without the proper licenses and no options are available to trace odd-manipulation. Besides that, gambling tax is evaded.[2]

With the rise of cryptocurrencies and blockchain as the underlying technology, another niche for online gambling arised. In this paper we will dive, as far as we know, into the unresearched field of automated gambling tax payments for on-chain gambling and come with creative ideas in order to actually implement this in a smart contract.

First, we will give a short introduction into blockchain in general and more specified into Ethereum. We will discuss smart contracts and the Ethereum Virtual Machine (EVM). After we explained the basics of the technology, we will take a look at the current situation of online gambling. What is the law, how does it work out for a gambler, for the platforms and for the Dutch tax authorities? We will discuss some advantages and disadvantages of the use of Ethereum smart contracts for automated tax payments with online gambling.

While writing this paper, we've come across some challenges, mitigations and possible solutions for it as well. We will discuss them in chapter 4. Besides that, we've thought about how Dutch legislation could be changed after/by using the above mentioned technology. We will deal with this briefly.

[1] De Kansspelautoriteit 2019.
[2] Boon 2018.

2. Blockchain & Ethereum explained

2.1 Blockchain

Blockchain is the fundamental part underlying the well-known cryptocurrency Bitcoin, which is proposed in 2008.[3] A blockchain can be described as a digital ledger, where (a lot of) independent computers in a distributed network own a copy of this ledger. Transactions are saved in this ledger and new transactions are broadcasted in the peer-to-peer network. Those transactions are collected and bundled in a *block* and when this block is completed it will be appended to the *chain* of existing blocks.

Important underlying concepts are peer-to-peer communication, cryptography and hashing. Peer-to-peer communication means that every node in the network is equal, there is no central point which decides about the validity of transactions.[4] With cryptography, pairs of keys are made: a private key and a public key that is deducted from the private key. While the public key could be seen as the bank number that is publicly available, the private key needs to be entered as pincode in order to spend cryptocurrency. Hashing means that an unique encryption is derived from the information which is computational infeasible to break, this is used in a way that transactions in the blockchain can't be changed.

2.2 Ethereum, smart contracts and the Ethereum Virtual Machine

After the creation of the Bitcoin-blockchain, several other blockchains arose. One of the first alternative cryptocurrencies is Ethereum. Where Bitcoin is purely based on transferring a form of digital cash, is Ethereum more focused on decentralized applications (DAPP's) and so-called smart contracts.[5] It is possible to program your own smart contract in the Ethereum network, something we did further on in this paper.

The name 'smart contract' is in the eyes of many people chosen totally wrong. A smart contract is definitely not smart as it only follows the pre-programmed rules. The smart contract isn't able to decide to deviate from those rules in order to get a justified outcome. Standard the smart contracts aren't legally enforceable as well, so they can't be seen as a legal contract.[6]

What a smart contract actually is, is a programmed if-this-then-that statement on for example the Ethereum blockchain. Mostly in the form of an agreement between two

[3] https://bitcoin.org/bitcoin.pdf.
[4] The Legal Aspects of Blockchain 2018, p.11.
[5] https://github.com/ethereum/wiki/wiki/White-Paper.
[6] The Legal Aspects of Blockchain 2018, p.90.

or more parties. These contracts are written in specialized programming code, so it's not immediately clear for everyone what the agreement is or the execution rules are.

In Ethereum those smart contracts are runned by an Ethereum Virtual Machine (EVM). This machine is capable to run any of the algorithmic programming code and execute the smart contracts.[7] By analogy, the EVM could be seen as the server that processes the 'if this, then that' rules.

An oracle is often used in smart contracts in order to get external data into the blockchain, for example price-feeds or weather information. This for example allows for advanced rules based on stockprices, winning football teams or tornadoes that happened. In our case, it would be possible to get the price of the crypto in euro at the time of the wage and use that in smart contract.[8]

3. Online gambling

3.1 Current Situation

As described in the introduction, at the moment regulation is problematic for blockchain based casinos. The online casinos which offer services to Dutch citizens don't comply with the legislation. When you as a Dutch citizen gamble in the 'Holland Casino', the casino company owned by the Dutch state, the casino itself pays the Dutch gambling tax called 'kansspelbelasting' to the tax authorities.[9] When you gamble online at an international online casino, you should file a tax return yourself.

In The Netherlands every online player that wins more than their wages in a certain calendar month needs to file a tax return and has to pay gambling tax, without any threshold.[10] Taxable is 30,1% of the difference between the amount won and the amount wagered.[11]

The total income of the 'kansspelbelasting' in The Netherlands over 2017 is € 503 million. This is for online gambling, but also for real-live casinos. In comparison with the total tax and contribution income of the Dutch state the 'kansspelbelasting' is only 0,18%.[12]

[7] Antonopoulus 2018
[8] https://docs.oraclize.it/#background.
[9] https://www.casino.nl/holland-casino-hoe-staat-het-met-het-staatsbedrijf/.
[10] Art. 1-1-e Wet op de kansspelbelasting jo. art. 3-1-c Wet op de kansspelbelasting.
[11] Art. 5-1 Wet op de kansspelbelasting.
[12] http://www.rijksbegroting.nl/2018/kamerstukken,2017/9/20/kst237146_2.html.

3.2 Use of blockchain at online gambling

There are a number of different online gambling platforms that use blockchain for storing transaction data and cryptocurrencies for bets and payouts. Most of these use Ethereum smart contracts. Dice2.win, for example, has dice and coin flip games, with a volume of €300,000/day.[13] Another platform, Xether.io, offers slots, roulette and drawing straws as well.

Beside all those Ethereum platforms there are even specific blockchains for betting in place, like Wagerr. Wagerr matches posted bets in order to give users the best odds wherafter oracles are used to retrieve event results, for example from soccer games.

For the platforms there are a few reasons to use a blockchain. First, it allows for verifiable fair betting, which means that every outcome of a bet can be independently verified and that tampering by the house or other players isn't possible. For the platform this means less costs of fraud.[14] This should also strengthen the faith of betters in the platform, even if they don't know the owners or company behind it. As the betted money doesn't touch the wallets of the platform owners until they lost their bet, the users won't have to be afraid of theft. Second, the whole process can be automated with the use of smart contracts that receive bets, pick winners and payout prices without any need for supervision or human intervention.

As the platforms use cryptocurrencies for the payments, all transactions and recordkeeping could be done on-chain. This allows the platform owners to stay pseudonymous as no bank account needs to be obtained and made available to customers. Both the platform and the gamblers are anonymous do need to reveal their public key, which could be seen as the bank account number of Ethereum. This is different from anonymous, as the parties do reveal some information. Because the identities of the actual persons stay unknown, higher risk of tax evasion is present.

3.3 Application in gambling tax payments: advantages

As we mentioned in the introduction, tax authorities have difficulties to check gambling tax indebtedness of internet platforms. Therefore an automated form of payment and recordkeeping could help all parties involved. First, the tax authority can be sure that enough tax is paid and the corresponding administration is directly available. Second, the platform doesn't have to worry about paying the taxes or auditing the records as this process will be automated. All transactions are stored in

[13] 8 June 2019, 1454 ETH * €215.
[14] Katalyse 2018.

the immutable blockchain, allowing easy verification and audits. Last but not least, the user of the platform can verify the gambling tax payments and therefore knows that the platform isn't evading tax which gives a certain legitimacy in the current online gambling space. Also, the user doesn't have to pay taxes himself as the payment is done in his name.

The automated payment could be implemented in online gambling platforms using cryptocurrencies with a smart contract. The smart contracts is called when a bet is placed. The platform sends a call to this smart contract with the amount of the bet and the amount of the winnings as a message. The smart contract could then save these information in order to keep the summed amounts per month. Shortly after the month is over, the smart contract could be (automatically[15]) called in order to calculate the tax payable. For this, the amount betted needs to be subtracted from the amount won. If the result is positive, which means that more money is won than waged, gambling tax has to be paid.[16] The smart contract could then pay a Payment Service Provider (PSP)[17] to handle the payment to the tax authority. Instead of using a PSP, a euro stablecoin[18] could be transferred to the cryptocurrency wallet of the tax authority. In Appendix 1 we added a self-written basic implementation of this, in a Solidity smart contract for Ethereum which pays the tax in ETH.

3.4 Disadvantages

An easy-to-spot disadvantage is that it's easy to evade this by unwilling platforms or users. If the users are consciously evading tax, they will just use another platform that isn't automatically paying their taxes. In a borderless system of online gambling, this is easy doable. However, tax evasion will always be a problem and should not prevent innovation, as other users will be persuaded to pay taxes if it is easy and stimulated for by the platform.

Different countries have different gambling tax laws. This means that every country has to have their own smart contract and the correct smart contract has to be called on a per-user basis. The users can claim that they are from another country in order to pay less or none tax, until a broadly accepted digital identity on the blockchain comes up.[19]

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[15] A smart contract only does something after a call. There for a call need to be scheduled, see for example https://ethereum-alarm-clock-service.readthedocs.io/en/latest/.
[16] If the player is taxable in The Netherlands.
[17] Like https://bitpay.com/ if the tax authority signs up, or https://bitbill.eu without their consent.
[18] Cryptocurrency with a stable value, mostly backed by reserve assets. For example the STASIS EURS ERC-20 token on Ethereum with a value pegged to the euro.
[19] See for example V. Tabora, 'The Use of Self-Sovereign Identity With Zero-Knowledge Proof (ZKP)', *Medium* 2 October 2018, medium.com for a blockchain-based implementation of this, based on Zero-Knowledge Proofs (which allows for confirming the country of tax residence without revealing all the identity data).

Another disadvantage is that it is hard to implement this solution for non-blockchain based gambling. As the data is not easily and publicly accessible and processable, the intended outcome couldn't be obtained.

Not even all cryptocurrencies allow for implementation of the automatic tax position calculation and the payment. For instance on Bitcoin, summing bets on a monthly basis is impossible because no Bitcoin Script OP_CODES[20] are available that refer to other transactions. The only solution could be a third-party arbitrator while the bitcoins are secured in a multi-signature transaction.[21] For every payout the tax percentage will be reserved in a special transaction. The cryptocurrency could then be paid to the tax authority respectively the user if 2-out-of-3 parties agree, functioning as an escrow. However, this takes away the automation and trustless payments.

As, according to the current law, you make a tax return once a month there is a big chance of currency gain ór loss during the month. Cryptocurrencies are in general very volatile as you can see in the pricing of the last years, so what to do with the gains or losses? Are those after the moment of winning also subjected to the gambling tax, or are those subjected to the capital gains tax which is covered by 'box 3' in The Netherlands? In our opinion it is the latter. After the gambling, you made a profit or loss in a amount of cryptos. It's your own choice to keep this profit in cryptos or trade it for, for example, euros. So the moment of winning (or losing) decides the amount of gambling tax which should be paid. In our script, it could be possible to add an oracle as an option to get the value of the cryptocurrency at that moment.

3.5 Challenges, mitigations and solutions

Every tax authority should have a crypto wallet which enables them to receive the tax payments in cryptocurrency. However, this could be mitigated by using a trusted third party as a payment service provider which pays the tax authority in name of the taxpayer. Preferably, this PSP is trusted by the tax authority like the US State Ohio used BitPay.[22] In that case the risk moves to the tax authority after the payment of the cryptocurrency to the PSP.

Beside the payment of the tax, a tax return has to be filed as well.[23] This could be removed if the tax authority receives this information automatically on the blockchain as well, but that will need a tax law change.

[20] Which could be seen as the rules for the next person wanting to spend them; https://en.bitcoin.it/wiki/Script.
[21] COTI 2017.
[22] https://bitpay.com/assets/ohio-becomes-first-state-toaccept-taxes-via-cryptocurrency.pdf
[23] Art.5a Wet op de kansspelbelasting

The number of the tax return needs to be in the payment description, if the PSP pays the euro's in name of the taxpayer, which includes the taxpayer identification number (BSN). As no personal information should be stored on the blockchain, this is problematic. The law, or policy from the Dutch tax authorities, needs to change on this part. We want to make a careful comparison with the last cases at the Autoriteit Persoonsggegevens (AP) where the VAT number of a self-employed person is the same number as their BSN. The AP judged that the Dutch tax authorities should provide an other, non-tracable, number to these persons. In our vision, we can compare this with the number which should be included in the payment description, otherwise the BSN number is out in the open on the blockchain for everyone.
If the tax authority sets up an oracle, this could give an unique payment description in response. While the tax authority has no information about the identity of the taxpayer, a taxpayer is always in the position to reveal his public key - and therefore the tax payments - when he is investigated. Therefore, in our opinion, no information about the gamblers would have to be shared before a gambler is investigated.

If oracles are used, the risk of oracle fraud arises. As oracles are centralized, they are in the position to impact the outcomes of a smart contract by giving false responses. Oracles must be chosen that offer verification tools, like Oraclize.[24] Multiple oracles could be used in order to tackle this as well. Arbitration could be used as final mitigation.

[24] https://docs.oraclize.it/#development-tools-network-monitor.

4. Conclusion

In this paper we've looked at the basic principles of blockchain, Ethereum, smart contracts and oracles. We also discussed the current status of (online) gambling and the taxation on gamblers in The Netherlands. In chapter three we've mentioned some online casinos which are already using blockchain and cryptocurrencies for their gambling.

In continuation of the basics mentioned above, we've discussed the advantages and disadvantages of taxing gambling results with the use of blockchain technology. The biggest advantage is that tax payments automatically will go to the tax authorities, and they can choose to hold on to the received cryptos or sell them for euros. This could all be done with the use of smart contracts, by example in a Ethereum blockchain, where automatically is calculated which amount of tax an individual should pay.

Also this system is easy to evade, when online casinos don't comply with possible future legislation where online casinos should use a blockchain. Just as the current situation, where casinos outside The Netherlands offer gambling possibilities to Dutch citizens what isn't allowed. Also taxpayers could choose another online casino who doesn't use blockchain technology and automatically tax payments. Also every country has their own legislation on the gambling area, so there must be multiple smart contracts. It's going to be difficult to proof of which country a gambler is from. Next to the above, true automation is for now not possible without a law change as the tax return has to be filed and the payment description has to include the taxpayer identification number.

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Appendix 1: Sample contract

```
pragma solidity ^0.5.0;

contract PayGamblingTax{

    //Save information about the owner of the smart contract which could be given extra rights
    address public owner;
    constructor() public{
        owner = msg.sender;
    }
    modifier onlyOwner() {
        require(msg.sender == owner, "Not authorized");
        _;
    }

    //Save the ETH address of the tax authority
    address payable taxAuthAddr = 0x14723A09ACff6D2A60DcdF7aA4AFf308FDDC160C;
    //Set the gambling tax percentage
    uint taxPerc = 3010; //30,1%

    //Create a record for each gambler
    struct Gambler {
        uint betted;
        uint won;
    }

    //Save all gamblers
    mapping (address => Gambler) gamblers;

    //Function to view the current gambling tax percentage
    function currentTaxPerc() public view returns (uint) {
        return taxPerc;
    }

    //Function to update the current gambling tax percentage
    function updateTaxPerc(uint newTaxPerc) onlyOwner public{
        taxPerc = newTaxPerc;
    }

    //Function to view the current tax authority address
    function currentTaxAuth() public view returns (uint) {
        return taxPerc;
```

```
    }

    //Function to update the current tax authority address
    function updateTaxAuthAddr(address payable newTaxAuthAddr) onlyOwner public{
        taxAuthAddr = newTaxAuthAddr;
    }

    //Function to add a new gambler
    function createUser(address gamblerAddr, uint bettedAmt, uint wonAmt) onlyOwner public
payable{
        gamblers[gamblerAddr] = Gambler({
            betted: bettedAmt,
            won: wonAmt
        });
    }

    //Function to view the taxable amount per gambler address
    function getTaxable(address gamblerAddr) public view returns (uint) {
        uint taxable = gamblers[gamblerAddr].won - gamblers[gamblerAddr].betted;
        return taxable;
    }

    //Give the possibility to broadcast a message with the amount of tax paid for which
gambler
    event Paid(
        address indexed _addressGambler,
        uint _toBePaid
    );

    //Function to pay the tax amount to the tax authority
    function payTax(address addressGambler) onlyOwner public payable returns (uint){
        uint taxable = gamblers[addressGambler].won - gamblers[addressGambler].betted;
        uint toBePaid = (taxable * taxPerc *100000000000000); //Amount in ETH
        gamblers[addressGambler].won = 0; //Reset amount won
        gamblers[addressGambler].betted = 0; //Reset amount betted
        taxAuthAddr.send(toBePaid); //Pay
        emit Paid(addressGambler, toBePaid); //Send a message as receipt of the payment
    }
}
```