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Tema:The Interaction of Major Crypto-assets, Clean Energy, and Technology Indices in Diversified Portfolios

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| 1 -2 | A high inflation era both in developed and developing economies also occurred at the end of 2021 which brought a harder challenge for portfolio managers, especially alpha investors, to achieve returns higher than inflation  In this context, traditional financial assets challenged by high inflation rates and fueled by digitalization in the finance industry, crypto assets are mentioned more frequently by both individual and institutional investors. Although they were strongly opposing to crypto assets before, largest banks such as JP Morgan and Goldman Sachs could not stand against crypto invasion and started to offer cryptocurrency services to asset customers  (...)  High of interest for crypto assets especially during the pandemic period, many institutions have started providing crypto services, while central banks have accelerated their digital currency work in the face of increasing demand. Investopedia1 reported that bitcoin surged 90 per cent during the pandemic. |  |
| 2 -3 | crypto assets can be classified into different categories, such as financial instruments, securities, commodities or payment instruments. Hence, growing institutional adoption and increased inflationary persistency have lifted cryptocurrencies to all-time highs during the pandemic, but not without too high volatility.  Supply limitation cryptocurrencies also protects the value of it against inflation and emerge as an investment alternative in the market. Looking at the performance of Bitcoin and Ethereum over the past year, we see that the returns on these assets are much higher compared to other investment instruments  The function of diversification is generally misunderstood or misinterpreted by practitioners. First, diversification is not a guarantee for a higher return compared to benchmark market returns. The main conclusion of the groundbreaking Modern Portfolio Theory (MPT) proposed by Markowitz (1952), the main purpose is not just to hold diversifies assets as portfolios, but also consider the relationship between the single assets of the portfolio  Since the portfolio manager will take a diversified portfolio perspective the more important part is how all the investments perform as a portfolio rather than the risk of any single asset. Moreover, cryptocurrencies’ adoption increases globally along with other stable coins and new block chain based applications while governments such as China and India have forbidden bitcoin trading. Hence the largest near term risk is the uncertainty based on regulator actions. As a result, cryptos disturb the portfolio selection perspective with their very high risk-return characteristics compared to traditional financial assets.  . According to Yermack (2015) the main reason for Bitcoin not being a useful unit of account is the high volatility of prices. Accordingly, Dyhrberg (2016) claims that due to its similar hedging capabilities with gold, Bitcoin can be utilized as a hedging tool against the UK stock market and US dollar. |  |
| 4-5 | Applying a quantile regression method, Bouri et al. (2017) investigate the relationship between gold and global uncertainty concluding that Bitcoin can also be an alternative hedging tool against global uncertainty at short term investment period. Brauneis and Mestel (2019) analyze risk-return benefits of portfolios which includes cryptocurrency by utilizing a Markowitz meanvariance framework. In the study they conclude that combining cryptocurrencies provides lower-risk for investment portfolios containing crypto assets. While other studies mostly focus on the diversification effect of adding one single cryptocurrency (usually Bitcoin) to a portfolio containing conventional asset classes, Brauneis and Mestel find solid potential for risk reduction when several cryptocurrencies are mixed. Platanakis and Urquhart (2020) study the potential out-of-sample benefits of adding Bitcoin to a stock-bond portfolio  Klein et al. (2018) compare commodities, cryptocurrencies and equity indices in terms of volatility behavior. According to the results of their study, Bitcoin cannot be named as the new Gold, which is also consistent with the argument of our own study. With a similar approach, Henriques and Sadorsky (2018) employ Modern Portfolio Theory and replace gold with Bitcoin in an investment portfolio to analyze possible effects of this replacement. According to their results although substituting gold for Bitcoin in a portfolio is possible it provides a high-risk adjusted return  Lopez-Cabarcos et al. (2019) show that Bitcoin volatility is highly unstable in speculative periods while in stable periods S&P 500 and fear index (VIX) are main influencers of its volatility. In this study they utilize GARCH and EGARCH models |  |
| 5 | On the other hand another major issue about cryptocurrencies is production cost and energy consumption for mining process as well as its environmental impact. Based on the amount of electricity required in mining, production costs are relatively high for both crypto asset and commodity markets which involve mining, however, renewable energy resources gradually reduce the cost by providing cheaper energy. Both commodity markets and crypto currency can be used as a store of value considering demand elements, however, cryptocurrencies are extremely sensitive to exchange rate risk as well as commodity price risk  . Cryptos have neither intrinsic values nor they can be used as units of account while commodities have both of these two properties. Another important issue is the price bubbles. Due to their highly speculative features, cryptocurrency assets are subject to abnormal returns for a small proportion of the investors which avoids cryptocurrency markets to create any real value for real economies and Society  Bitcoin supporters highlight that in 2020, 76% of digital asset miners used renewable energy based resources during their production process.  In Canada, the government had to stop further requests of power from crypto miners who consume too much energy with their mining processes (Meyer, 2018). Moreover, Gurrib (2019) finds energy spot markets tend to move together, with energy based crypto currencies. Chuen et al. (2018) utilized crypto index CRIX and reported low correlations with other commodities like gold, however, found a negative relationship between crude oil and energy cryptos. Investors do not contribute to mining process directly but still Bitcoin allocations increase the carbon footprints of their existing portfolios. Even if investors do not construct a portfolio consisting of only cryptocurrencies, they still have negative impact on the environment indirectly.  combined daily return graphs of BTC, ETH, MSCIWIT and SPGCE show that the volatility of BTC (...) is too high compared to MSCIWIT and SPGCE (...)  These high volatile assets make it harder for portfolio managers to combine cryptocurrencies with traditional financial assets since mean reverting approaches like Markowitz has limits to solve the optimization problem without any constraints. |  |
| 9 | Compared to traditional financial assets major crypto-assets’ volatility is still high but they give signs of maturing. Investors can utilize traditional portfolio allocation approaches to adjust their asset allocation by weighting volatility inversely. Obviously with this approach assets with higher volatility will occupy a lower portion in the portfolio. Another aspect of cryptocurrencies is its mutual relationship with energy, especially renewables, companies. Many energy companies started to invest in cryptocurrencies suggesting that they have a shared understanding  of the role bitcoin mining should play in the grid. Moreover, aside from the environmental risks associated with these new types of currencies, there is also a view that the technology empowering them could also be a key enabler of the energy transition so there is a highly mutual relationship between cryptocurrencies, technology companies and renewable energy companies |  |