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Mirror Effect on the Currency Arbitrage Model on HK Link Exchange Rate System

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ABSTRACT

This article conducts an in-depth examination of the concept of the 'mirror' effect within a sophisticated currency arbitrage framework, specifically applied to the Hong Kong Dollar (HKD) linked exchange rate system (LERS). It intricately analyzes the dynamic interactions between market forces and arbitrage activities that uphold the currency peg to the US Dollar (USD), with a particular emphasis on the innovative Mirror Risk-Rate (RR) arbitrage paradigm. The proposed model suggests that an escalation in perceived macroeconomic or geopolitical risk associated with the HKD precipitates a corresponding escalation in its domestic interest rates, exemplifying a "mirror effect"—a feedback mechanism that is crucial for the sustainability of the peg. Empirical analysis and rigorous theoretical discourse elucidate how this arbitrage mechanism facilitates a self-regulating process, effectively harnessing the 'invisible hand' of the market to preserve monetary stability, thereby reducing dependency on direct official interventions and canonical exchange rate policies.

Key words: Currency Arbitrage, Mirror effect, Mirror Risk-Rate (RR) arbitrage Model, linked exchange rate system (LERS)

Introduction:

The contextual background indicates that the Hong Kong Dollar (HKD) experienced significant speculative activity by investors in the year 1983. As a strategic response to these market pressures and to mitigate potential financial instability, the Hong Kong Monetary Authority (HKMA), in consultation with the Hong Kong government, implemented a currency peg system. This system linked the HKD to the United States Dollar (USD) at an approximate exchange rate of 7.8 HKD per USD, utilizing a currency board arrangement to ensure credibility and stability. Established in 1983, the Hong Kong Linked Exchange Rate System exemplifies a hybrid exchange rate regime that aims to retain a delicate equilibrium between exchange rate stability

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and economic flexibility. The regime functions as a quasi-fixed exchange rate system, which, while providing a credible anchor for monetary policy, remains vulnerable to external shocks such as large capital flows, speculative attacks, and volatility arising from global financial market turbulence. These ongoing challenges test the resilience of the peg and necessitate meticulous macroprudential oversight. [1][2]

Currency arbitrage, exploiting price differentials of currencies across markets, plays a critical role in maintaining this linkage by aligning interest rates and mitigating mispricing risks. Within this context, this research article hope to modify the link exchange rate system, by putting the new innovative model of mirror effect, that refer the risk rate at the position of the both equal likely side, which by the side by side mechanism, the mirror model, will be an effective tool, to manage the link exchange rate system without extra, power force, for example like the government intervention, by so, it will reduce huge amount of capital money by the reserve of the government. The mirror effect refers to the phenomenon where rising risk in the HKD market is immediately reflected ("mirror") in its interest rate, incentivizing arbitrage that consequently restores equilibrium.

The primary objective of this research thesis is to conduct a comprehensive and in-depth examination of the mirror effect phenomenon, with a particular focus on analyzing the RR arbitrage model that has been proposed in recent scholarly research regarding the Hong Kong Link Exchange Rate System. The study aims to elucidate the theoretical foundations, mathematical intricacies, and practical implications of the model, providing a thorough understanding of its role in market dynamics, arbitrage strategies, and regulatory considerations within the context of local and international financial stability. By integrating complex economic principles and advanced quantitative methods, the thesis seeks to contribute valuable insights into the systemic behavior and potential vulnerabilities associated with the HKD exchange rate mechanism.

Discussion:

The challenges of the current link Exchange Rate System

The Hong Kong Linked Exchange Rate System (HK LERS) has operated for over 40 years. This system mandates that each issued Hong Kong Dollar (HKD) must be fully collateralized by USD reserves held in a designated reserve account. It maintains the exchange rate within a fixed band, typically around HKD 7.75 to 7.85 per USD, through automatic backing rather than discretionary interventions. Current challenges include capital outflows and inflows, which affect adjustments in the reserve backing of the system. When there is a large capital outflow, reserves may run out sooner or later, potentially weakening the response to domestic economic fluctuations.

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Additionally, the system relies on the power of authorities, which could quickly deplete reserves. Therefore, it is critical to maintain confidence in the financial system and ensure the smooth functioning of Hong Kong's highly open and export-oriented economy. [3]

Moreover, traditional monetary management often depends significantly on direct, authoritative intervention strategies, such as foreign exchange market operations involving the buying or selling of Hong Kong Dollars (HKD) or United States Dollars (USD). These interventions are intended to influence currency supply and stabilize exchange rates. However, such mechanisms may prove to be ineffective or incur prohibitive costs during periods of heightened market volatility or when faced with persistent external shocks, such as geopolitical tensions, global economic downturns, or abrupt changes in capital flows. In these contexts, the efficacy of conventional intervention strategies diminishes, necessitating the consideration of more nuanced policy tools or the adoption of macroprudential measures to maintain monetary stability and optimize foreign exchange reserves. [4]

Why an innovative mechanism is needed:

The "mirror effect" in currency arbitrage describes a complex, dynamic relationship where fluctuations in currency risk exposure are directly reflected in the interest rate differentials across involved currencies. Specifically, within the framework of the Risk-Return (RR) model, an escalation in the perceived risk associated with the Hong Kong Dollar (HKD)—which can be triggered by factors such as **capital flight**, **geo-location tensions**, or **speculative attacks**—prompt market participants to demands a higher interest rate on HKD-denominated assets. This increase serves as a risk premium compensation, mirroring the heightened geopolitical or macroeconomic uncertainty. The model encapsulates how risk premiums are integrated into the price of assets, ensuring that investors are adequately compensated for anticipated currency depreciation or volatility, thereby maintaining equilibrium in the foreign exchange and capital markets.

(i). Capital flight

When a capital flight occurs, it involves substantial and swift outflows of both domestic and foreign financial resources. This phenomenon disrupts the delicate equilibrium of capital flows required to maintain a fixed exchange rate or currency peg. Such outflows can undermine investor confidence, destabilize the currency markets, and strain the foreign exchange reserves of the central bank. The resulting imbalance complicates monetary policy implementation and increases susceptibility to speculative attacks, ultimately threatening the macroeconomic stability of the economy.

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(ii). Geo-location tensions

The geopolitical and macroeconomic frictions associated with geo-location tensions fundamentally exacerbate the inherent vulnerabilities within the Hong Kong-linked Exchange Rate System (LERS). The ongoing strategic and economic confrontations, particularly the monetary regime's long-term credibility and operational stability. These tensions heighten concerns regarding the sustainability of the currency peg, as escalation could provoke volatile capital flows, induce speculative attacks, and undermine market confidence. Furthermore, such geo-locational frictions can introduce increased uncertainty into financial markets, leading to liquidity risks and complicating policy responses, thereby challenging the resilience of Hong Kong's financial architecture and raising critical questions about the regime's robustness amid evolving geopolitical risks.

(iii). Speculative attacks

These attacks exploited in high volatilities vulnerabilities speculative attacks will damage Hong Kong's Linked Exchange Rate System by exploiting capital flow dynamics to pressure the fixed currency peg. The system's design, including full foreign reserve backing, will be one of the draw back of the peg exchange rate system design, since intervention of the link exchange rate system cause huge amount of gov't foreign reserves.

The innovative Mechanism Mirror Effect of the Risk-Rate Arbitrage Model:

The innovative mirror model functions as a real-time risk assessment tool, wherein fluctuations in the interest rate serve as an indicator of perceived risk levels. By capturing the dynamic shifts in interest rates, which are reflective of market sentiment and macroeconomic conditions, the model provides a nuanced measure of risk premium adjustments. This approach enhances the precision of risk evaluation by translating monetary policy signals and investor confidence indicators into tangible risk metrics, thereby offering a sophisticated mechanism for financial risk management and decision-making.

A higher interest rate incentivizes capital inflows by offering increased returns on financial assets, which can attract foreign investment and reduce capital outflows. This dynamic helps stabilize or appreciate the domestic currency and creates advantageous conditions for currency arbitrage opportunities, as disparities in exchange rates and interest differentials become more pronounced. This innovative mirror model aimed at controlling currency for the **automatic stabilization**, by the market, and is critical in the context of international capital mobility and the uncovered interest rate parity condition.

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The mirror econ-maths model:

$$\int \frac{\partial \mathcal{R}isk}{\partial t} = \int \frac{\partial \mathcal{R}ate}{\partial t}$$

(With respect to the certain amount of time)

This mirror model implies that when there is a certain amount of speculative demand for money that impacts the peg system, holding the HKD currency involves higher risk. As a result, interest rates will be higher, which aligns with and is consistent with the risk associated with the interest rate. Therefore, more people will hold HKD when the interest rate rises.

This innovative mirror model allows arbitrageurs to exploit discrepancies in interest rate differentials across various currency markets by engaging in currency carry trades. They purchase undervalued currencies with relatively lower interest rates and simultaneously sell overvalued currencies with higher interest rates. This arbitrage activity exerts market pressure that tends to realign exchange rates, driving them back toward the established interest rate parity or linked exchange rate regimes. Such operations contribute to the convergence of actual exchange rates toward their theoretical equilibrium values predicted by the interest rate parity condition, thereby facilitating market efficiency. Especially, by the market force (this mirrors the RR model).

Hence, this endogenous adjustment mechanism functions autonomously to restore equilibrium by harnessing the inherent corrective signals embedded within market processes, by **market's invisible hand**, thereby obviating the need for direct intervention by central authorities. Instead, it relies on market disciplinarity and informational efficiency to realign supply and demand, ensuring macroeconomic stability through decentralized, price-driven signals. This innovative model can be serve as the **automatic stabilizer**.

Suggestion: Innovative Mirror Model (Mirror Effect)

Mirror arbitrage generally involves exploiting price differences related to "mirrored" or synthetic assets, especially within Mirror arbitrage trading strategies in the currency markets. In this research paper, we focus on how to automate a mirror arbitrage system, where the risk ratio acts as a mirror reflecting interest rates. When a currency crisis occurs, meaning the currency is under attack, the risk-rate system (mirror system) will activate. As a result, the interest rate will rise to match the level of the currency's risk.

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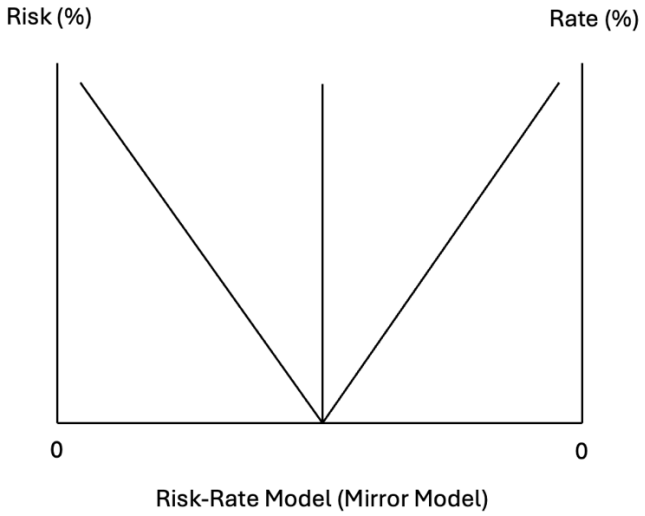
Innovative link exchange rate **Mirror** Arbitrage Model



Risk-Rate Model (Mirror Model)

The Mirror Practice facilitates the development of synthetic arbitrage, known as the "mirror-effect," which replicates the price of real-world assets such as currencies on bilateral currency exchanges. Traders are able to exploit price discrepancies between these synthetic assets and their actual counterparts, as well as across various exchanges, to execute arbitrage strategies and generate profits from price differentials.

Broadly speaking, 'mirror arbitrage' is a concept primarily used in traditional markets such as forex. It involves investors automatically copying the currency trades of experienced traders in real time. Automated platforms mimic the trader's actions, allowing investors to leverage expert strategies without manual effort. The purpose of mirror trading is to reduce emotional decision-making, enhance diversification, and provide access to sophisticated trading techniques.

Optimization of modification reforms can be applied to the arbitrage mechanism and the function of the capital currency pool. The carry currency trade and risk ratio act as pricing tools to adjust prices and maintain the linked exchange rate. This enables currencies from both sides to be hedged more effectively. A new, optimized mirror arbitrage currency model provides the foundation for price adjustment, carry, and risk hedging to balance interest rates and risks. Consequently, the arbitrage function can be used more effectively.

Conclusion:

This pioneering mirror currency arbitrage framework significantly diverges from conventional

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interventionist monetary policies that rely heavily on official authority and direct market manipulation. Instead, it leverages the principles of the invisible hand by facilitating autonomous, **market-driven arbitrage** activities within the foreign exchange markets. This mechanism inherently fosters the self-correcting nature of currency valuation, thereby promoting the resilience of the Hong Kong dollar (HKD) peg under various macroeconomic and geo-locational shocks. The innovative mirror currency arbitrage model ensures the stability of the currency peg without necessitating explicit interventions, thereby maintaining market and operational efficiency. Empirical validation through rigorous data analysis from Hong Kong's foreign exchange market, supplemented by comparative cross-jurisdictional studies, substantiates the model's robustness, indicating its practical applicability and theoretical soundness within the framework of contemporary currency stability economics.

References

[1] Hong Kong Monetary Authority. (2024). Annual report 2024.

[2] Hong Kong Monetary Authority. (2025). Annual report 2025.

[3] Hong Kong Monetary Authority. (2025). Annual report 2025.

[4] Hong Kong Monetary Authority. (2025, June). *Quarterly Bulletin* (June 2025 issue).

