

An Analysis of Inflation in Singapore

Zixia Huang

United World College of South East Asia, 139654, Singapore

Abstract: In August 2022, inflation in Singapore soared to 7.5%, and the CPI for all items for general households rose by 6.1 per cent, higher than the 2.3 per cent increase in 2021 (Singapore Department of Statistics, 2023). This work uses AD-AS model, exchange equation (primarily money supply and velocity of money), and the concept of “hot money” to identify and comprehensively evaluate factors causing inflation in Singapore in 2022. This work also includes four key recommendations to the Singapore government and the Monetary Authority of Singapore (MAS) based on the overall conclusion reached in the last section of this essay.

Keywords: Inflation; Singapore Economy; AD-AS Model; Monetary Equation; Hot Money

1. Introduction

1.1 Research Background

In 2022, the world encountered significant challenges in both the geopolitical landscape and economic development. Two economic factors drastically changed the global economy and added inflationary pressure. First, as many countries adopted quantitative easing policies to stimulate recovery from the temporary recession caused by the outbreak of COVID-19; consumption and investment began to quickly expand in many of these countries, causing real GDP to increase while also giving expansionary pressure on the price level. Second, the Russian-Ukraine War, which broke out on February 24th, exacerbated a shortage of oil and gas supplies, as Russia, one of the most powerful suppliers of oil and natural gas, stopped supplying oil and gas to the global market. Consequently, oil prices increased from 78.44 dollars per barrel on January 4th to 116.23 dollars per barrel on May 30th. Since oil is an essential resource for all sorts of productions of goods and services, firms had to reduce production in order to minimize economic losses. As a result, production in many regions declined, putting the global economy at the risk of stagflation.

Like many countries, Singapore has suffered from inflation. The inflation problem garnered attention from Singapore citizens, investors, and decision-makers. With the annual all items inflation rate of 6.12% in 2022, Singapore has encountered high, if not hyper, inflation. Increases in prices of individual items are even more shocking: transport prices increased to their highest since July 1980, food prices are at their highest since November 2008, electricity and gas prices also touch highest on record, and housing and utilities inflation are their highest since December 2012 (Jamrisko, 2022). Additionally, Singapore’s core inflation holds firm at a 14-year high of 5.5% in February, directly impacting the daily lives of Singaporean citizens (Cue, 2023). By running down a comprehensive checklist, this work aims to identify what factors have contributed to Singapore’s inflation of 2022 and beyond and to investigate the extent to which these factors affect the price level of Singapore.

1.2 Research Significance

Studying how different economic factors can influence price level can benefit both individual investors (or consumers) and decision-makers. For individual investors, analyzing the causes of inflation can help them by providing more logical insights about the business world, and for policymakers in the Central Bank or government, understanding the mechanism of inflation is even more crucial, since these decision-makers need to have tremendous experience and knowledge about the economic events of their nation as well as its unique economic characteristics in order to foster an optimum environment for economic growth. Therefore, by comprehensively examining and weighing numerous factors that could have inflationary pressure on the Singapore economy, this

article aims to describe how the price level in Singapore surged to such an astonishing level in 2022. Indeed, numerous research papers about inflation problems in Singapore have been published and have had subsequent influence over concerned economists. Nevertheless, few papers considered hot money as one of the driving factors in the fluctuations of price-level. Thus, this piece of work is the first one to analyze causes of inflation in Singapore by applying a comprehensive checklist that includes not only the traditional AD-AS model, but also evaluates whether changes in money supply still strongly affects the inflation problem in Singapore and whether hot money, which could theoretically devastate small economies, plays a role.

2. Literature Review

This work first uses the AD-AS Model to discuss the causes of inflation in Singapore from the aggregate demand side and the aggregate supply side. Then, the essay considers exchange equation to explain monetary phenomena that might contribute to Singapore’s inflation. At last, the work examines whether the movement of hot money has contributed to Singapore’s inflation.

2.1.1 The Concept AD-AS Model

John Keynes proposed the classical AD-AS Model to explain various economic situations. The intersection point of aggregate demand (AD) and aggregate supply (AS) in the model indicates the equilibrium price level and real GDP. To calculate aggregate demand, this article uses the expenditure approach—adding private consumption expenditure, government consumption expenditure, gross fixed capital formation, changes in inventories, and net exports of goods and services.

Inflation can be classified into three categories using AD-AS Model: Demand-pull Inflation, Cost-push Inflation, and Mixed Inflation. In the case of Singapore, this article believes that the inflation can be regard as “mixed”. In this case, as indicated by the self-drawn graph below (Graph I), while real output (real GDP) remains uncertain, price level has increased tremendously.

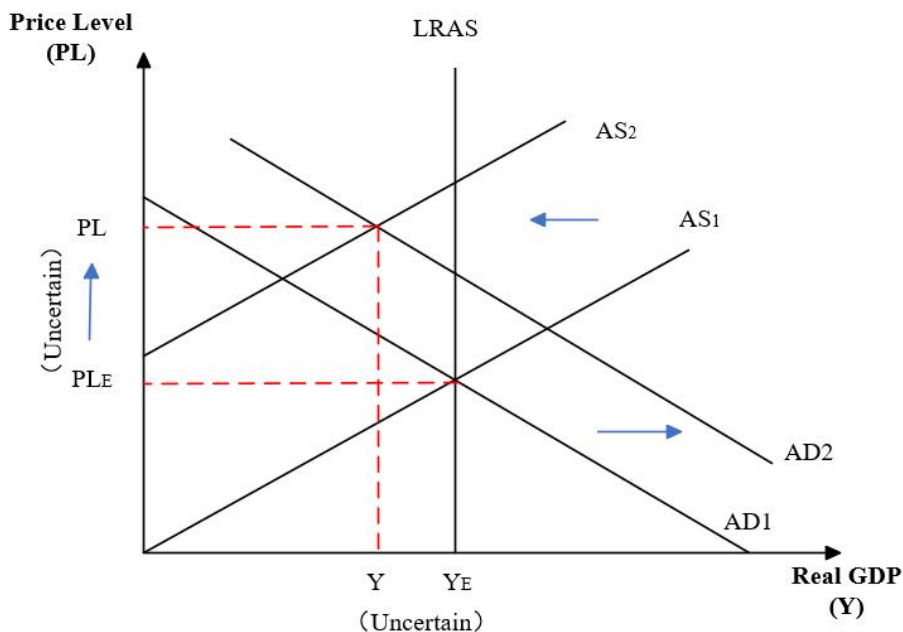


Fig.1 AD-AS Model describing economic situation in Singapore

Singapore’s aggregate demand has increased drastically since 2020 quarter 2, as the country adopted continuous expansionary monetary and fiscal policies. Such a recovery maintained its positive trend in 2022, even though the economy was intentionally slowed down by the MAS (Monetary Authority of Singapore), as it raised interest rates from the 0%-1% interval to the 3%-4% interval throughout 2022. Thus, Singapore’s economic situation in 2022 was partially caused by a process of increase in aggregate demand, which lasted from 2020 Quarter 2 to around 2022 Quarter 1 (Graph II).

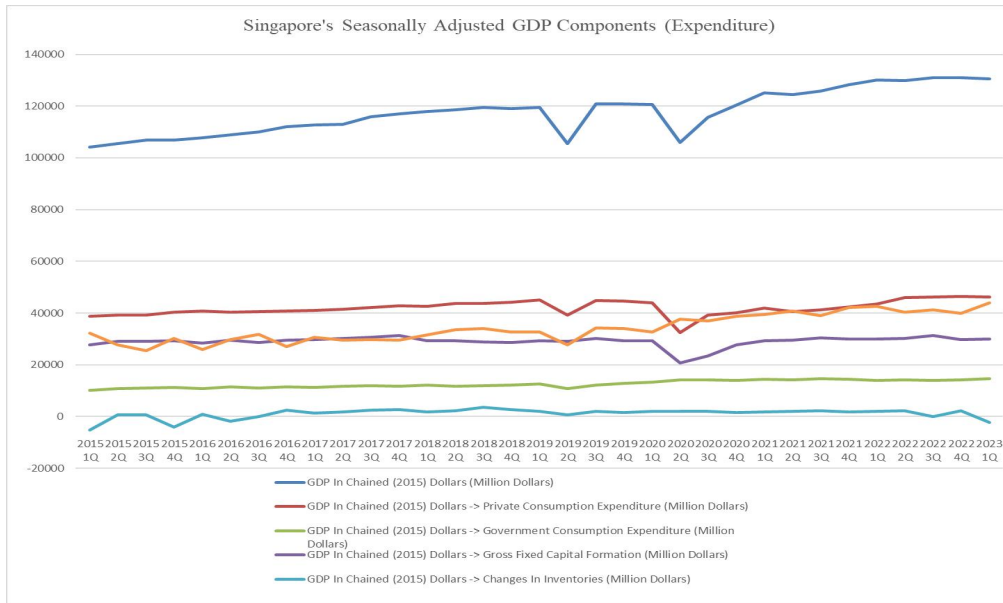


Fig.2 Singapore Seasonally Adjusted GDP (components) versus Time Graph

However, the recovery from the Covid-19 pandemic can only explain the overall trend of Singapore’s economic growth; in contrast, individual components of aggregate demand require more specific explanations.

2.1.2 Consumption

Before the Russia-Ukraine war broke out, the Singapore government put in continuous efforts to stimulate economic recovery through decisive policy responses like the Jobs Support Scheme, which helped minimize economic scarring, while rapid vaccinations and longstanding robust economic fundamentals helped Singapore navigate global challenges during the pandemic (Srinivasan and Leigh, 2022). As the result of the combination expansionary policies on fiscal and monetary sides, private consumption expenditure increased from SGD 32.5 billion in 2020 Quarter 2 to SGD 42.4 billion in 2021 Quarter 4, approaching the pre-covid levels of SGD 44.7 billion in 2019 Quarter 4. However, the fact that China, Singapore’s biggest pre-covid trade partner, did not fully open its border for international trade in 2022 failed Singapore’s attempt to recover tourism, one of its backbone industries. Additionally, it is worth noting that Singapore has an obviously convex population pyramid (Graph III), indicating aging issues; thus, it is uncertain whether Singapore’s private consumption can expand further.

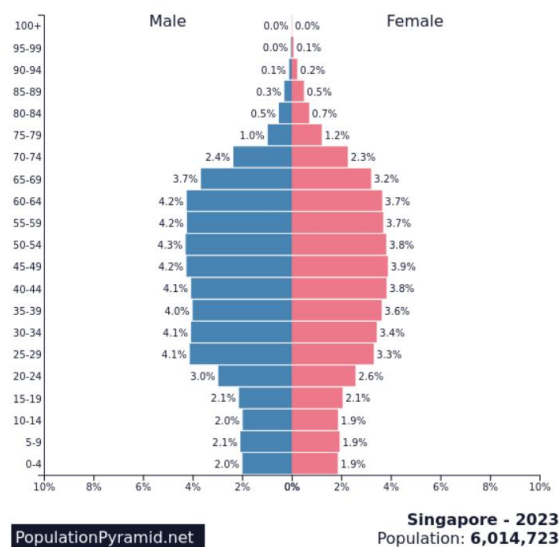


Fig.3 Singapore Population Pyramid (from Population Pyramid)

2.1.3 Investment

Domestic investment (mostly gross fixed capital formation) in Singapore increased as the Singapore government stimulated post-covid economic recovery, as can be seen from Graph 2. The recovery of this type of investment, however, pales in comparison with that of financial investment, which can largely boost economic growth by increasing employment rates, corporate profits, and thus purchasing power, even though it is not included in either the calculation of GDP or consumer price index (CPI). During the war, many investors began to transfer their assets from certain world-renowned banking countries to more politically stable and neutral financial centers like Singapore. Additionally, Switzerland, Singapore's strong competitor for banking services, became infamous for conducting immoral behaviors like leaking clients' personal data, making Singapore, a country with one of the most reliable financial systems and transparent governments, more popular among investors. Consequently, Singapore's capital inflow increased shortly after the outbreak of the Russia-Ukraine War, as 2022 annual capital flows reached SGD 195 billion, which is a 10% increase from 2021, and more importantly, an all-time high.

The change in inventories, even though not significant compared to any other components of GDP, is an ideal indicator of a nation's economic situation. That is, when the change in inventories is positive, supply of goods and services is greater than demand, indicating that economic growth is weak; in contrast, if the change in inventories is negative, demand of goods and services is greater than the supplier of them, implying that the economic growth is strong. As can be shown in Graph 2, inventories stayed positive throughout most of 2022, indicating that the Singapore economy remained strong.

2.1.4 Government Expenditure

Singapore spent 10.02% of its GDP for government expenditure. Such an amount was spent for two main purposes: firstly, the Singapore government aimed to improve quality of citizens' lives. This has become particularly challenging, as aging in Singapore has become more severe in recent years. Consequently, social spending "makes up the largest part of annual government expenditure", and a very big part of the increase "has gone towards improving the quality, accessibility and affordability of healthcare, for which spending has tripled over the last decade" (Fiscal, 2022a). Secondly, the government also invested heavily in "skills, education and infrastructure to develop our people and lay the foundations for long-term economic growth" (Fiscal, 2022b). Singapore restricted government expenditure to 10.02% of GDP. This can be considered as a significant drop because the government expenditure in 2022 dropped 2.2% compared to 2021, so the government expenditure did not add further inflationary pressure on the Singapore economy.

2.1.5 Net Export

Like many importing economies in the world, Singapore, a country where more than 90% of its GDP comes from import, seemed to be one of the biggest victims of the energy crisis. In 2022 Quarter 2, however, export and import of goods both increased substantially because of the increase in transportation fees, which was the direct result of the disruption of oil supply. Specifically, export of goods increased 13.1%, and import of goods increased 11.3%. Interestingly, the top three commodity exports and imports are both comprised of machinery & transport equipment, chemicals & chemical products, and miscellaneous manufactured articles, inferring that the impact of the energy crisis on Singapore's economy has been largely mitigated because of its perfect balance in international trade. Therefore, even though the import price index (2018=100) of oil rose from 104.0 in 2021 to 145.0 in 2022, the rise of export price index of oil from 98.3 in 2021 to 147.8 in 2022 mitigated this sharp increase of import costs, so that the difference between the two indices all-item was only 0.8. However, it is worth noting that despite only accounting for 0.8% and 0.1% of the total import and export volumes, import price index and export price index of animal & vegetable oils and fats & waxes also increased to 174.8 and 146.7 respectively, as geopolitical issues like the Russia-Ukraine War forced Ukraine, the "breadbasket of Europe", to end its supply of agricultural products, which in turn added tremendous inflationary pressure on citizens' daily lives, if not the GDP. In sum, net export was surprisingly not a deterrent factor in the inflation in Singapore.

2.1.6 Cost of Production (supply side)

The increase in energy prices still made production of goods and services in Singapore difficult. The fact that only a small portion of production is powered by renewable energy made Singapore even more vulnerable to considerable fluctuations in energy prices. According to the U.S. Energy Information Administration, "petroleum and other liquids represent 86% of Singapore's primary energy

consumption, followed by natural gas at 13%”, while renewable energy sources only account for the less than 1% of primary energy consumption. The predominance of biofuel energy in industrial production is even more evident, as natural gas generated more than 90% of total power used in production of goods and services in Singapore. In contrast, contributions from renewables, coal, and petroleum products only in total accounted for less than 10% of electricity generation. Thus, in Singapore, “major fluctuations in the domestic inflation rate were mostly driven by import costs and the occurrence of crises” (Chow, 2023) because of the economy’s heavy reliance on traditional biological fuels like hydrocarbon resources, which Singapore does not have at all. Consequently, Singapore’s manufactured products price index and domestic supply price index reached a 10-year high of 113.3 and 120.8 respectively (both regard 2018 as the base year). Therefore, it is feasible to conclude that the increase in the cost of production added “stagflationary” pressure on the economy.

2.2 Monetary concerns

Not every economist resonates with John Keynes. Many instead assert that inflation is largely due to monetary issues. Milton Friedman is perhaps the most famous economist holding this view, claiming that inflation “is always and everywhere a monetary phenomenon”. His words can be converted to the exchange equation: $MV = PY$. That is, real output (Y) of an economy and velocity of money (V) are presumably stable, so if money supply (M) increases at a greater rate than real output does, price level (P) would then increase. This work delves into the “M” and “V” section of the exchange equation to investigate their impacts on the price level in Singapore.

2.2.1 Money Supply (M)

The 2008 financial crisis made economists dwell on one crucial question: is the traditional view that a significant increase of money supply would lead to inflation still applicable in the real-world today? The answer is no: in their paper, Qiu and Liang state that after the 2008 financial crisis, quantitative easing policies adopted by developed economies did not bring about the expected increase in inflation rate. Instead, these policies promoted the continuous expansion of the finance and real estate industry. Also, from 2008 to 2018, stock market capitalizations and financial asset values of developed countries and regions increased more than 50%, while price level in general stayed low (Qiu and Liang, 2022). What is more remarkable is that in 2022, the total housing market value of the U.S, China, and Britain was 177.9%, 235.9%, and 394.5% of 2022 annual GDP respectively. Singapore, as a finance center of Asia, is not an exception: market capitalization to GDP ratio is 139.8%. This infers that Singapore has a big fictitious economy that is even larger than Singapore’s real economy.

Usually, a large fictitious economy acts as a magnet to divert away from the real economy, forming a fictitious economic ecosystem independent from the real economy. Consequently, even if the Central Bank increases money supply, much of the money newly created will be “sucked” to the stock market, so asset prices in the fictitious economy rise quickly, while the price level of the real economy is likely to stay unchanged. In the case of Singapore, this phenomenon is obvious: from 1995 to 2015, the elasticity of CPI to change in M2 (Money Supply) is 0.0685, and the correlation between the two variables is 0.97; however, from April 2016 to 2023, the elasticity dropped to 0.408 and the correlation dropped to 0.6178. Such changes were statistically significant, indicating that Singapore’s price level is becoming less vulnerable to increase in money supply, as the fictitious economy, especially the financial services sector, which becomes more “magnetic” over time. Therefore, even though M2 in Singapore overall increased during the country’s recovery stage after the pandemic (even though M2 slightly decreased in 2022 due to high inflation), M2 is unlikely to be a decisive factor driving Singapore’s inflation rate.

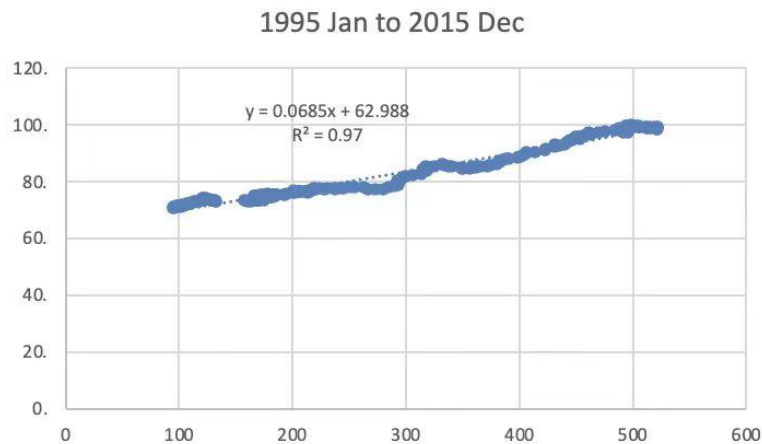


Fig.4 Consumer Price Index versus Money Supply Graph

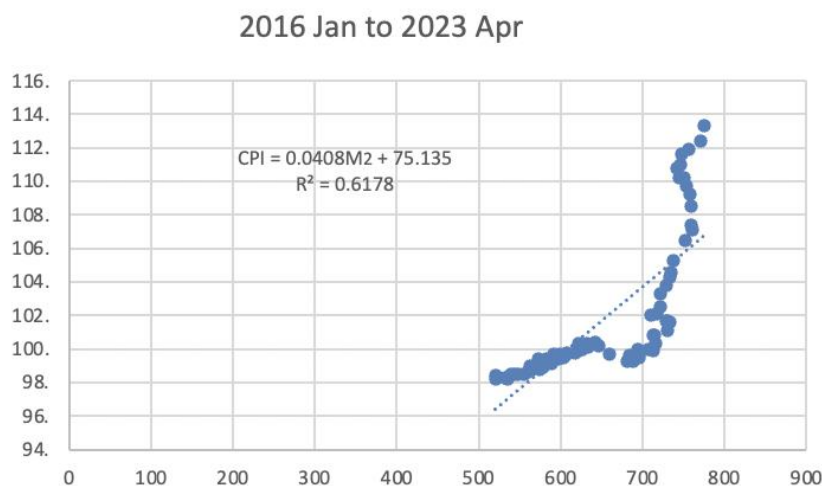


Fig.5 Consumer Price Index versus Money Supply Graph

2.2.2 Velocity of Money (V)

Velocity of money is also a crucial factor of inflation. The exchange equation shows that $V=PY/M$ (the product of P and Y is Nominal GDP). Therefore, if nominal GDP increases at a faster rate than money supply does, then velocity will increase. Qiu and Liang pointed out that increase in velocity suggests that the rate production and/or consumption increases, and this needless to say, would have direct impacts on prices of goods and services. Thus, the greater the velocity, the greater the inflationary pressure. However, as mentioned in 2.2.1 above, the Singapore stock market and financial services could act like a bumper that potentially buffers the flow of money into the economy. Plus, as can be seen in the case of China and the US, the bumpers of the two economies become more powerful over time, causing velocity to steadily decrease in recent years while the velocity of the fictitious economy fluctuates tremendously (Qiu and Liang). So, the velocity of money in Singapore would theoretically be significantly reduced, if the bumper is indeed strong enough.

This work plots a nominal GDP versus money supply graph to show the trend of velocity of money in Singapore from 2015 to 2022. To match the data series of velocity and money supply, the work converts quarterly GDP to monthly GDP using the simple interpolation method. Therefore, minor details of estimated monthly GDP values might to be inaccurate, so the graph can only show the overall trend; also, considering the fact that the work does not use X-12 method to seasonally adjust the results of velocity calculation, so the values derived might be slightly different from those of others' work.

According to Figure 6, velocity of money dropped significantly in 2020 and recovered to precedent level within two years, and then maintained a mild but positive slope throughout 2022.

The result corroborates with the work's established views. That is, the graph verifies that nominal GDP indeed grew at a faster

rate than money supply during Singapore’s recovery stage post-Covid, with a remarkable comeback of private consumption and the revival of keystone industries like tourism. However, it is unclear whether Singapore’s fictitious economy is strong enough to essentially prolong the time for which currency chases commodity prices, because from 2015 to 2019, the velocity of money seemed to be stable and even had an overall positive trend, and this is different from the gradual decreases of velocity in countries (e.g., China and the US) that do have strong fictitious economies that act like bumpers. Thus, velocity of money in Singapore did increase during the Russia-Ukraine War, but it is unclear the extent to which velocity of money increased.

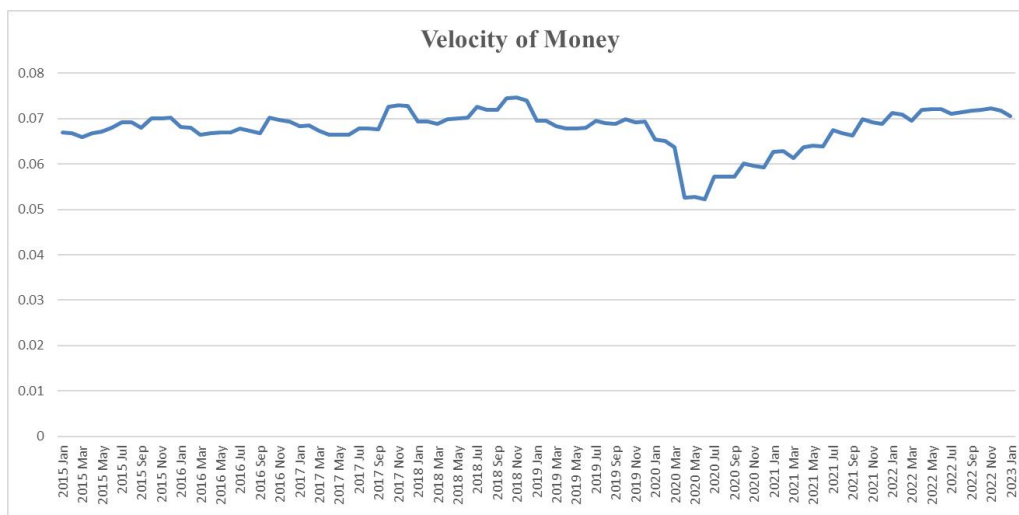


Fig.6 Velocity of Money versus Time Graph

2.3 Hot Money

Hot money is the flow of money that can circulate very fast and usually move around different economies for exchange arbitrage and interest rate arbitrage without staying in one place for a relatively long time, causing great fluctuations in domestic price level. Even though the consideration of hot money is neither included in the AD-AS Model nor the exchange equation, it is still one thing that governments around the world actively monitor. It is also likely that at least some hot money comes from illegal activities where criminals are desperately in need of money laundering to evade police investigations. Even though the emergence and movement of hot money seems like natural economic behavior, hot money can significantly harm an economy. In their research papers regarding hot money, Lueth Erik (2007) and Alketa Hysenbegasi (2006) found that in the case of Sri Lanka, the Caribbean, and Latin America, the amount of hot money inflow is positively related to CPI and the value of a country’s currency in the international market. Therefore, it is feasible to claim that hot money flow, if strong enough, can cause noticeable turbulences in price level.

However, as mentioned in 2.2.1 and 2.2.2 above, a fictitious economy can act like a magnet and a bumper to soothe the impact of increasing money supply and velocity of money respectively. In fact, a third simile can be used to describe a fictitious economy’s soothing effect on price level in the real economy - that is, the fictitious economy acts as a reservoir that stores the flood of hot money, so the downstream, which is the real economy, will not be flooded too much and too quickly, leaving the real economy plenty of time to react.

The graph below shows that in Singapore, hot money has little impacts on CPI, as the correlation coefficient of CPI and hot money flow is positive but too statistically insignificant, suggesting that the reservoir of Singapore’s economy is large enough that regardless of how much hot money flows into or out of Singapore in the short-term, price level will likely stay unaffected. Thus, hot money flow does not account for the inflation in Singapore in 2022.

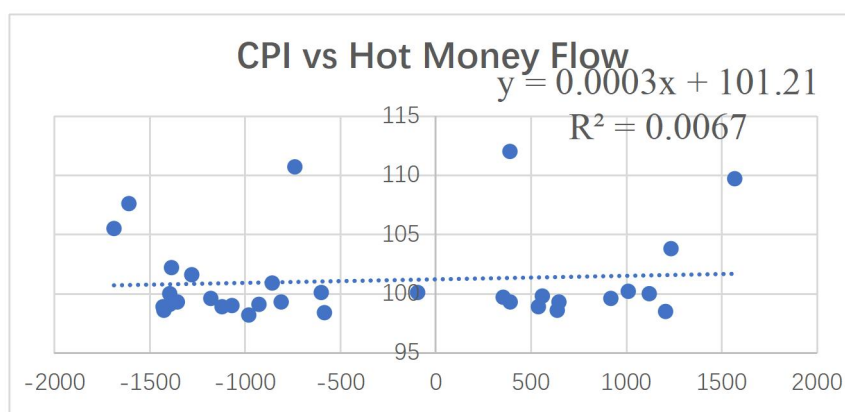


Fig.7 CPI versus Hot Money Flow Graph

3. Conclusion and Suggestions

Singapore inflation is complex and is likely to be a result of changes in multiple perspectives. Using the AD-AS Model, it's to be concluded that consumption increased significantly, so it added inflationary pressure on Singapore's price level. Gross capital formation increased mildly, playing a relatively minor role in the rise of price level in Singapore. Change in inventories mostly stayed positive in 2022, suggesting that Singapore's economy stayed prosperous during 2022. Financial investment, even though not directly counted in GDP, has an expansionary chain effect on the Singapore economy. Government expenditure did not expand at all in 2022; net export, on the other hand, increased considerably, adding to Singapore's inflation rate. Using the exchange equation, this work found that money supply has some degree of contribution to Singapore's inflation, but it is unlikely a decisive factor. On the other hand, it is very likely that velocity of money has contributed significantly to Singapore's inflation. Hot money, in contrast, had mainly negligible impacts on CPI overall.

Conclusively, this work has several suggestions for Singapore's government and the MAS. First, this work suggests that the MAS should not only focus on CPI and core inflation rate, but also keep an eye on the Strait Index to prevent economic crisis resulting from overheating of fictitious economy. Second, Singapore's government should try to import key materials like fossil fuel and animal oil from different countries, so the risk of import-inflation can be mitigated to the largest extent. Third, profits of export-focused firms in Singapore have been harmed by the appreciation of the Singapore Dollar, so the government should dedicate efforts to create distinctive Singapore-style industries to stand out in the global market. Fourth, Singapore's government should continue its effort to monitor hot money, especially hot money that bonds with illegal activities.

References

- [1] Auto, H. (2022, May 23). Global food inflation, Ukraine war hot up cooking oil prices. The Straits Times. Available from: <https://www.straitstimes.com/singapore/consumer/global-food-inflation-ukraine-war-heat-up-cooking-oil-prices>.
- [2] Cue. (2023, March 23). Singapore core inflation holds firm at 14-year high of 5.5% in February. The Straits Times. Available from: <https://www.straitstimes.com/business/singapore-core-inflation-holds-firm-at-55-in-february>.
- [3] Fiscal. (n.d.). MOF. <https://www.mof.gov.sg/policies/fiscal>
- [4] Hysenbegasi, A. (2006). Remittances and Currency Crises. Wellbeing and Socail Policy Journal.
- [5] ITA. (n.d.). Energy Resource Guide - Singapore - Oil and Gas. International Trade Administration| Trade.gov. Retrieved July 10, 2023, from <https://www.trade.gov/energy-resource-guide-singapore-oil-and-gas>.
- [6] Jamrisko, M. (2022, August 23). Singapore Inflation at Highest in 14 Years on Food, Fuel. Markets Inflation & Prices.
- [7] Lueth, E., & Ruiz-Arranz, M. (2006). A gravity model of workers' remittances. IMF Working Paper, 06(290), 1.
- [8] Qiu, & Liang. (2022). Changes in the Manifestation of Inflation, Main Causes and Suggestions. Southwest Finance.
- [9] Singapore Department of Statistics. (2023). Singapore Consumer Price Index by Household Income Group, Jul-Dec and Full Year 2022. Singapore Department of Statistics. Available from: <https://www.singstat.gov.sg/-/media/files/news/cpi-jul-dec-2022.ashx#:~:text=For%20the%20whole%20of%202022,per%20cent%20increase%20in%202021>.
- [10] Srinivasan K and Leigh L. Singapore's Economy Rebounded on Decisive Policy Action, But Challenges Lie Ahead. (2022,

August 5). IMF. Available from: <https://www.imf.org/en/News/Articles/2022/08/05/cf-singapore-economy-rebounded-decisive-policy-action>.

[11] Trading Economics. (n.d.). Singapore Consumer Price Index (CPI) - June 2023 Data-1961-2022 historical. Available from: <https://tradingeconomics.com/singapore/consumer-price-index-cpi>.

About the Author: Huang Zixia (2007), male, Han Dynasty, Wenchang Municipal High School, Hainan Province, United World College of South East Asia.