ÉCOLE DOCTORALE SCIENCES ÉCONOMIQUES, JURIDIQUES, POLITIQUES ET DE GESTION
Université Clermont Auvergne

École Doctorale des Sciences Économiques, Juridiques, Politiques et de gestion
Centre d'Études et de Recherche sur le Développement International (CERDI)

Université Clermont Auvergne, CNRS, IRD, CERDI, F-63000 Clermont-Ferrand, France

TROIS ESSAIS SUR LES PROBLÈMES MONÉTAIRES ET DE CHANGE AU VIETNAM

Thèse présentée et soutenue publiquement le 18 mai 2022 pour l'obtention du titre de Docteur en Sciences Économiques

par

Van Vinh DO

sous la direction de Michaël GOUJON

Membres du Jury

Martine AUDIBERT	Directrice de Recherche CNRS	Présidente du jury
Jean-François HOARAU	Professeur à l'Université de La Réunion	Rapporteur
Serge REY	Professeur à l'Université de Pau et des Pays de l'Adour	Rapporteur
Michaël GOUJON	Maître de conférences à l'Université Clermont Auvergne	Directeur de thèse

ACKNOWLEDGEMENT

I cannot express enough gratitude towards my supervisor, Associate Professor Michaël GOUJON, who has provided me with great supports and encouragement all along my PhD. Many thanks for always finding time to conduct and discuss to my work, and boost and help me to progress. Thank you so much your confidence in me whenever I was in the doubts of myself. Thank you so much for your deep academic insights and suggestions during the PhD journey. Thank you for helping me to integrate into life from the first day I came to Clermont-Ferrand, France. I always think that those days are the most memorable time in my life.

I would like to express my gratitude to Professor Martine AUDIBERT, Professor Jean-François HOARAU, and Professor Serge REY. Thank you so much for having accepted being committee members and for previous comments and suggestions.

I am grateful to the Madame Professor Mary-Françoise RENARD, Monsieur Bertrand LAPORTE and all members and friends of the CERDI. Thank you very much for your valuable helps.

I am grateful to my family and friends, without whom it is impossible for me to reach this stage. Thank you so much to my wife Nga and my daughter Khanh Minh. I am indebted to my family for their love, patience and encouragement during all along my work.

I would like to thank the financial support from Vietnamese Government for my PhD in France.

TABLE OF CONTENTS

LIST OF ABBREVIATIONS

ADF	Augmented Dickey-Fuller test
BER	Black exchange rate
BRER	Bilateral real exchange rate
CPI	Consumer price index
GDP	Gross Domestic Product
GSO	General Statistics officice of Vietnam
IER	Interbank exchange rate
IMF	Intenational monetary fund
NEER	Nominal effective exchange rate
OER	Official exchange rate
PPP	Purchasing power parity
REER	Real effective exchange rate
RER	Real exchange rate
SBV	State Bank of Vietnam
SOEs	State-Owned Enterprises
VAR	Vector Autoregression
VECM	Vector error correction model
VND	Vietnam dong
USD	United States dollar
WTO	World Trade Organization

RÉSUMÉ DE THÈSE DE DOCTORAT

Le processus de transition économique du Vietnam est connu sous le nom de *"rénovation"* ou *"đổi mới"* depuis 1986. Il a consisté en des réformes visant à transformer le modèle planifié centralisé en une économie de marché *(Vietnamien: Kinh tế thị trường theo định hướng xã hội chủ nghĩa)*. Depuis lors, l'économie vietnamienne s'est progressivement intégrée à l'économie mondiale[1]. Le Vietnam est rapidement devenu l'une des économies les plus ouvertes du monde, avec un ratio commerce/PIB de plus de 200% et un ratio investissements directs étrangers/PIB de 6% en moyenne au cours des dernières décennies.

Après plus de 30 ans, le Vietnam a obtenu plusieurs résultats impressionnants en matière de performance économique, de réduction de la pauvreté et d'amélioration du niveau de vie de la population. En ce qui concerne la performance économique, la croissance économique a atteint 7,4 % par an dans les années 1990, puis a légèrement diminué à 6,9 % par an dans les années 2000 et à 6,2 % par an dans les années 2010. Le PIB par habitant s'est amélioré, passant d'environ 500 dollars (constants, base 2015) en 1990 à 2.650 dollar en 2020 (source Banque Mondiale). Le pourcentage de personnes vivant sous le seuil de pauvreté national a diminué progressivement, passant de 58 % en 1993 à 20,7 % en 2010 et à 6,7 % en 2019.

Bien que l'économie ait obtenu des résultats remarquables, de nombreux défis subsistent. Premièrement, l'inflation est élevée, persistante et volatile, ce qui a réduit le succès de la croissance économique et érodé la confiance du public. Alors que la banque centrale, la Banque d'État du Vietnam, vise à atteindre la croissance économique et la stabilité des prix, le pays a connu une inflation élevée et volatile, son taux d'inflation étant le plus élevé des pays asiatiques ces dernières années (FMI, 2006; Bhattacharya, 2014). Des études antérieures telles que Goujon (2006) ont montré que le Vietnam restait une

[1] Le Viêt Nam est devenu membre de l'OMC en 2007 ; il a signé un accord commercial bilatéral (ACB) avec les États-Unis en 2000 ; il a adhéré à la zone de libre-échange de l'Asean (AFTA) en 1995 ; il s'est engagé à rejoindre le partenariat économique stratégique transpacifique (TPP) en 2016.

économie fortement dollarisée et que l'inflation était affectée par les variations du taux de change et un excès de la masse monétaire.

Deuxièmement, le niveau du taux de change, malgré une énorme dévaluation nominale au cours des dernières décennies, est généralement considéré comme étant surévalué. La valeur du dong vietnamien est imposée à une valeur élevée par rapport aux monnaies des partenaires commerciaux, ce qui réduit la compétitivité relative des biens nationaux.

Dans cette thèse, nous nous attacherons à analyser la politique monétaire et la politique de change et leur contribution à l'atteinte des objectifs de stabilité des prix, du taux de change et de maintien de la compétitivité.

La Banque Centrale, la Banque d'État du Vietnam, représente une partie intégrante du gouvernement du Vietnam qui met en œuvre la politique monétaire et la politique de taux de change. Dans un travail antérieur à la thèse, en utilisant les méthodes de Grilli, Masciandaro et Tabellini (1991) et de Cukierman (1992) sur des indices d'indépendance des banques centrales, nous avons montré que l'indépendance de la banque centrale du Vietnam est inférieure à celle des autres pays émergents (Vinh Van Do et Nga Thi Thuy Duong, 2014)[2]. Dans la gestion de la politique monétaire, la Banque d'État du Vietnam suit les agrégats monétaires comme un objectif intermédiaire pour atteindre la croissance économique et la stabilité du niveau des prix. La première question est alors de savoir si l'agrégat monétaire choisi était approprié pour atteindre la stabilité du niveau des prix, ce qui conduit à explorer les caractéristiques et la stabilité de la fonction de demande de monnaie. En ce qui concerne la politique de change, le régime de flottement dirigé qui a été adopté conduit à s'interroger sur la cause de la dynamique du taux de change et à se demander si son niveau est proche du niveau d'équilibre qui garantirait la compétitivité des biens nationaux par rapport à ceux des partenaires commerciaux.

Régimes de taux de change du Vietnam :

Selon la classification des régimes de change du Fonds monétaire international, le Vietnam a suivi,

[2] Voir Vinh Van DO et Nga Thi Thuy DUONG (2014) Measuring Central Bank Independence in Vietnam (en anglais), Journal of Economics and Development, Vol.16, No.1, avril 2014, pp. 40-59.

- des taux de change multiples (avant 1989)
- des bandes rampantes (1989-1990) ;
- un taux de change fixe à l'intérieur de bandes horizontales (1991-1993) ;
- un dispositif conventionnel de parité fixe (1994-1996) ;
- bandes rampantes (1997-1998) ;
- dispositif conventionnel à parité fixe (1999-2000) ;
- parité à crémaillère (2001-2007) ;
- bandes rampantes (2008-2011) ;
- le régime conventionnel à cheville fixe (2012-2015).

Cette thèse comprend trois chapitres. Le chapitre 1 présente les déterminants d'une fonction de demande de monnaie au Vietnam sur la période de janvier 2000 à décembre 2016. La relation entre le taux de change nominal et le taux de change parallèle de janvier 2000 à décembre 2015 est étudiée dans le chapitre 2. Le dernier chapitre porte sur le déséquilibre du taux de change réel dans la période de 1990-2016.

Dans le chapitre 1, nous présentons le cadre de la politique monétaire au Vietnam. Nous étudions les fonctions de la demande de monnaie en utilisant divers agrégats monétaires afin de trouver une fonction appropriée qui serait utilisée par la Banque d'État du Vietnam pour atteindre la stabilité du niveau des prix. Une fonction stable de la demande de monnaie est une condition préalable à la conduite d'une politique monétaire efficace, en particulier dans les pays qui suivent un cadre de ciblage monétaire. La détermination d'une fonction de demande de monnaie relie généralement un agrégat monétaire à une mesure des transactions économiques réelles ou du revenu et aux coûts d'opportunité de la détention de monnaie. Cette fonction renseigne sur un taux d'expansion relatif entre l'agrégat monétaire et le revenu à long terme. De plus, l'impact de la masse monétaire sur l'économie réelle ne peut être compris et prédit que si la fonction de demande de monnaie est stable.

Nous étudions donc la fonction de demande de monnaie pour le Vietnam en utilisant les données de la période allant de janvier 2000 à décembre 2016 en appliquant une approche standard de cointégration. Nous examinons à la fois l'agrégat monétaire de la monnaie nationale et l'agrégat plus large qui inclut la monnaie étrangère.

Les résultats donnent des informations intéressantes. Premièrement, nous constatons que le taux d'intérêt n'est pas un déterminant pertinent dans la fonction de demande de monnaie. Ceci signalerait l'application de contrôles administratifs lourds qui ne permettent pas une détermination par le marché monétaire et des fluctuations équilibrantes dans un marché monétaire sous-développé pour la monnaie nationale au Vietnam. Le résultat est cohérent avec les travaux empiriques précédents. Bhattacharya (2014), sur la période de 2001:Q1 à 2012:Q4, trouve que les taux d'intérêt n'ont aucune relation avec M2 (mais seulement avec la croissance du crédit). Les résultats de Pham et Riedel (2012) révèlent que les autorités, dans la conduite de la politique monétaire, s'appuient sur des contrôles administratifs, tels que le contrôle des taux d'intérêt, les objectifs de croissance du crédit, les quotas sur les prêts par secteur, qui faussent les marchés du crédit, entraînant une mauvaise allocation du capital.

Deuxièmement, les résultats indiquent que la demande de monnaie réelle est très sensible au taux d'inflation attendu et à la dépréciation du taux de change. Conjointement avec l'exclusion des taux d'intérêt comme déterminant de la demande de monnaie, ceci indique que les actifs réels sont plus attractifs que les actifs financiers lorsque les agents économiques cherchent à se couvrir contre l'inflation. En particulier, les prix des actifs réels augmentent généralement plus que le taux de rendement des actifs financiers. En outre, le marché boursier est immature et peu actif, et les agents économiques se tournent vers les marchés fonciers et immobiliers et/ou vers le marché de l'or pour se procurer des réserves de valeur et des actifs spéculatifs.

Troisièmement, les résultats montrent que le taux d'inflation n'est pas significativement affecté par l'excès de monnaie (mesuré par l'écart entre l'offre de M2D et la demande de M2D estimée). Il serait cependant affecté par les chocs monétaires à court terme et par les salaires, les prix mondiaux, tout en étant inertiel.

Le résultat de l'estimation de la fonction de demande de monnaie pour M2 (y compris la monnaie étrangère sous la forme de dépôt bancaires libellés en monnaie étrangère) montre un faible impact du coût d'opportunité de la détention de monnaie car il inclut les dépôts en monnaie étrangère qui sont considérés comme des actifs de couverture. Lorsque les coûts de détention de la monnaie nationale augmentent, les agents économiques peuvent

convertir leurs actifs en monnaie nationale en monnaie étrangère dont le prix peut augmenter.

Le chapitre 2 explore la relation entre le taux de change officiel et le taux de change parallèle au Vietnam. Nous présentons la politique de taux de change et la cause de l'émergence d'un change parallèle, dans les économies en développement et au Vietnam. Nous analysons la dynamique du taux de change officiel et du taux de change parallèle. Nous développons ensuite un modèle empirique pour tester cette relation entre les deux taux, donnant un aperçu de la manière dont la Banque d'État du Vietnam mène la politique de change.

Les transactions de change au Vietnam coexistent sur un marché officiel et des marchés noirs. Le marché officiel est un marché où les transactions de change sont effectuées entre les banques commerciales et leurs clients finaux, avec un marché interbancaire entre les banques commerciales autorisées et les établissements de crédit, où la Banque d'État du Vietnam, intervient pour déterminer le niveau du taux de change officiel.

Les opérations de change hors banques entre entreprises et/ou particuliers nationaux sont légalement interdites mais sont plutôt tolérées, voire ignorées, par les autorités, ce qui laisse la place au développement des marchés parallèles. Cependant, les autorités vietnamiennes sont restées silencieuses sur l'importance et le rôle des marchés parallèles, alors que des preuves montrent que les transactions sur les marchés parallèles ne sont pas anecdotiques.

La question sur laquelle nous nous concentrons est de savoir si le marché parallèle joue un rôle dans la politique de change officielle, ou si le marché noir ne représente qu'un marché résiduel qui est influencé par les événements qui se produisent sur le marché officiel. L'influence mutuelle que les deux marchés peuvent avoir l'un sur l'autre dépend de conditions très spécifiques, telles que la taille relative des deux marchés, la porosité entre eux, et si les acteurs d'un marché observent et utilisent les informations sur les déséquilibres entre l'offre et la demande qui se reflètent dans la variation du taux de change sur l'autre marché. Cette question est relative à la discussion sur l'efficacité du marché ou l'efficacité informationnelle.

Pour tenter de répondre à ces questions, nous étudions la relation entre le taux de change parallèle et le taux de change officiel au Vietnam sur la période 2000-2015 avec des données mensuelles. Nous appliquons une analyse de cointégration et une spécification de modèle vectoriel de correction d'erreur qui nous permet de tester l'exogénéité des taux de change et de révéler les relations à long et court terme entre les deux taux de change.

Premièrement, les résultats montrent qu'une telle relation existe entre les deux taux de change à long terme. Cela implique que les deux marchés de change ne sont pas entièrement segmentés. Nous constatons que seules les variations du taux de change officiel sont influencées par la prime sur le marché parallèle (l'écart par rapport à la relation de long terme). Cela suggère que les variations du taux de change parallèle conduisent la Banque d'État du Vietnam à ajuster le taux de change officiel pour éliminer l'écart entre les deux taux à long terme. Nous ne pouvons pas rejeter l'hypothèse selon laquelle la Banque d'État du Vietnam utilise le taux de change parallèle pour former des anticipations de taux de change ou comme un proxy pour le niveau d'équilibre du taux de change à cibler.

Deuxièmement, le taux de change parallèle n'est pas influencé par la relation de long terme, indiquant que le marché noir est relativement autonome par rapport au marché officiel. À long terme, les conditions d'offre et de demande sur le marché officiel n'affectent pas les conditions d'offre et de demande sur le marché noir. De plus, les agents opérant sur le marché noir n'utilisent pas de manière simple les informations provenant du marché officiel, qui seraient révélées par les variations actuelles du taux de change officiel. A l'inverse, il apparaît que les agents du marché noir utilisent des informations externes qui leur permettraient de former des anticipations spécifiques sur le taux de change, lesquelles, en vertu d'anticipations autoréalisatrices, pourraient affecter le taux de change parallèle courant.

Dans le chapitre 3, nous étudions les déterminants à long terme du taux de change effectif réel et la présence d'un déséquilibre du taux de change réel au Vietnam.

En ce qui concerne les questions de gestion du taux de change, le taux de change réel (TCR) est conventionnellement considéré comme une variable centrale dans les travaux théoriques et empiriques. Il s'agit d'une mesure de la compétitivité dans la production de biens et services échangeables d'un pays par rapport à ses partenaires commerciaux.

Cependant, les concepts et les mesures de TCR restent un défi dans les travaux empiriques, en particulier pour ceux qui couvrent les économies en développement (Edwards, 1988 ; Hinkle et Montiel, 1999). Le TCR externe est le taux de change nominal ajusté pour les prix relatifs entre le pays et les pays étrangers et est la variable habituelle pour estimer le niveau du TCR dit d'équilibre et les désalignements (sous-évaluations ou surévaluations) qui sont une question importante dans la gestion macroéconomique.

L'évaluation du désalignement du TCR au Vietnam n'a été étudiée que par quelques travaux. Le TCR est souvent considéré comme surévalué, affaiblissant la compétitivité du pays dans le commerce international (Nguyen et Nguyen, 2009 ; Nguyen et al, 2010). Cependant, Bui et al. (2017) dans une estimation économétrique récente du TCR d'équilibre et du désalignement montrent que le désalignement du TCR n'est pas durable et varie dans le temps. Par conséquent, la question du désalignement du TCR est toujours d'actualité, en particulier pour les autorités vietnamiennes qui cibleraient un bon niveau du TCR.

Parce que le TCR du Vietnam n'est pas publié dans les bases de données internationales, nous calculons d'abord différentes mesures du TCR bilatéral et multilatéral du Vietnam par rapport à ses principaux partenaires commerciaux en utilisant des données mensuelles sur 1999-2017. Ensuite, nous examinons l'hypothèse bien connue de la parité du pouvoir d'achat en nous basant sur des tests de racine unitaire et de cointégration. Les résultats montrent que la parité de pouvoir d'achat peut être rejetée dans le cas du Vietnam sur la période. Cela implique que les variations du taux de change nominal et du niveau des prix relatifs ne sont pas égales ou proportionnelles.

Troisièmement, nous construisons un modèle empirique pour étudier le taux de change réel d'équilibre basé sur l'hypothèse de "l'effet Balassa-Samuelson". Cependant, en raison du manque de séries trimestrielles et mensuelles des fondamentaux, nous utilisons des séries annuelles du taux de change effectif réel sur la période 1990-2016 qui proviennent d'une base de données produite par le CERDI[3]. Les résultats montrent qu'il existe une relation de long terme entre le taux de change effectif réel, la productivité relative et

3 CERDI: Centre d'Études et de Recherches sur le Développement International. L'auteur remercie Martine Bouchut pour l'accès à ces données.

l'ouverture commerciale. L'examen du désalignement du taux de change réel permet de faire des suggestions aux autorités vietnamiennes dans la mise en œuvre de la politique de change. Une politique de taux de change flexible basée sur les facteurs fondamentaux pourrait préserver la compétitivité de l'économie vietnamienne. De plus, cette politique permettrait d'unifier progressivement les deux devises étrangères, ce qui contribuerait à lutter contre la volatilité de l'inflation au Vietnam.

En conclusion, le marché monétaire est étroit et encore sous-développé comme en témoignent les taux d'intérêt qui ne constituent pas un coût d'opportunité de la détention de monnaie à long terme. On peut en déduire que les actifs réels resteraient plus attractifs que les actifs financiers. De plus, le taux de variation du prix des actifs réels est généralement plus élevé que le taux de rendement des actifs financiers, ce qui conduit les agents économiques à posséder des actifs réels pour préserver leur pouvoir d'achat (l'or, biens immobiliers, voitures...). Par ailleurs, les restrictions d'accès au marché officiel des changes et la rigidité du taux de change officiel, font également des devises étrangères une réserve de valeur pour se prémunir contre l'inflation. Par conséquent, les ressources peuvent être détournés de l'investissement dans les activités économiques, ce qui rend difficile la réalisation des objectifs de la politique monétaire tels que la croissance économique et la stabilité du niveau des prix.

Bien que le *"đổi mới"* ait été lancé en 1986 dans le but de transformer l'économie en une économie de marché, il semble que le Vietnam soit toujours dans le processus de transition. En ce qui concerne la politique monétaire et la politique de taux de change, un certain nombre de réformes semblent encore nécessaires. L'indépendance de la Banque d'État du Vietnam pourrait alors être renforcée pour accroitre la crédibilité de ces nouvelles réformes.

References

Bhattacharya, R. (2014). Inflation dynamics and monetary policy transmission in Vietnam and emerging Asia. *Journal of Asian Economics*, *34*, 16-26.

Bui, D.H., Makin, A.J., and Ratnasiri, S. (2017). Is Vietnam's exchange rate overvalued? *Journal of the Asia Pacific Economy*, 22:3, 357-371.

Cukierman, A. (1992). *Central bank strategy, credibility, and independence: Theory and evidence*. MIT press.

Edwards, S. (1988). Real and monetary determinants of RER behavior: Theory and evidence from developing countries. *Journal of development economics*, *29*(3), 311-341.

Goujon, M. (2006). Fighting inflation in a dollarized economy: The case of Vietnam. *Journal of comparative economics*, *34*(3), 564-581.

Grilli, V., Masciandaro, D., & Tabellini, G. (1991). Political and monetary institutions and public financial policies in the industrial countries. *Economic policy*, *6*(13), 341-392.

Hinkle, L. E., & Monteil, P. J. (1999). Exchange rate misalignment: Concepts and measurement for developing countries. *Oxford University Press*.

IMF. (2006). IMF country report No. 06/421.

Montiel, P.J., P-R Agenor and N. Ul Haque. (1993). Informal Financial Markets in Developing Countries. *Oxford: Blackwell Publishers*, 26-41.

Nguyen, T.T.H., & Dinh, T.M., & To, T.T., & Le, H.G., and Pham, V.H. (2010). Vietnam annual report 2010: The choice for sustainable growth - Chapter 4. *Nhà Xuất Bản Tri thức*, Hà Nội, 6/2010 (in Vietnamese). Link: http://dl.ueb.vnu.edu.vn/bitstream/1247/52/2/NC-21.pdf

Pham, T. T. T., & Riedel, J. (2012). On the conduct of monetary policy in Vietnam. *Asian-Pacific Economic Literature*, *26*(1), 34-45.

Phuc, N. T., & Duc-Tho, N. (2009). Exchange rate policy in Vietnam, 1985–2008. *ASEAN Economic Bulletin*, *26*(2), 137-163.

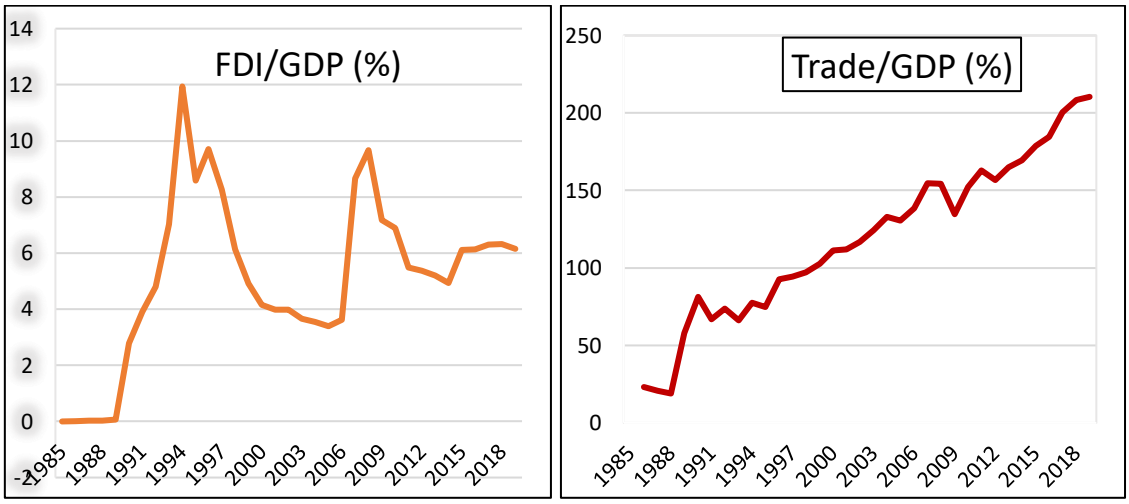
Vinh Van DO and Nga Thi Thuy DUONG. (2014). Measuring Central Bank Independence in Vietnam (in English), Journal of Economics and Development, Vol.16, No.1, April 2014, pp. 40-59.

Vo, T.T., Dinh, H.M., Do, X.T., Hoang, V.T., and Pham, C.Q. (2000). Exchange rate arrangement in Vietnam. *East Asian Development Network*, December 2000.

GENERAL INTRODUCTION

The process of economic transition of Vietnam was launched in 1986. Widely known as *"renovation"* or *"đổi mới"*, it has consisted in reforms to transform the centrally planned model to a market-oriented economy. Since then, the Vietnamese economy has been gradually integrated into the world economy. Vietnam became a member of the WTO in 2007; signed a Bilateral Trade Agreement (BTA) with the United States in 2000; joined into the Asean Free Trade Area (AFTA) in 1995; signed a commitment to join the Trans-Pacific Strategic Economic Partnership (TPP) in 2016. Vietnam has rapidly become one of the most open economies in the World, with a ratio of trade to GDP at more than 200% and a ratio of foreign direct investment to GDP at an average of 6% over the last decades.

Figure 1. Trade (%GDP) and Foreign direct investment inflows, net (%GDP) – Vietnam, 1985-2019.

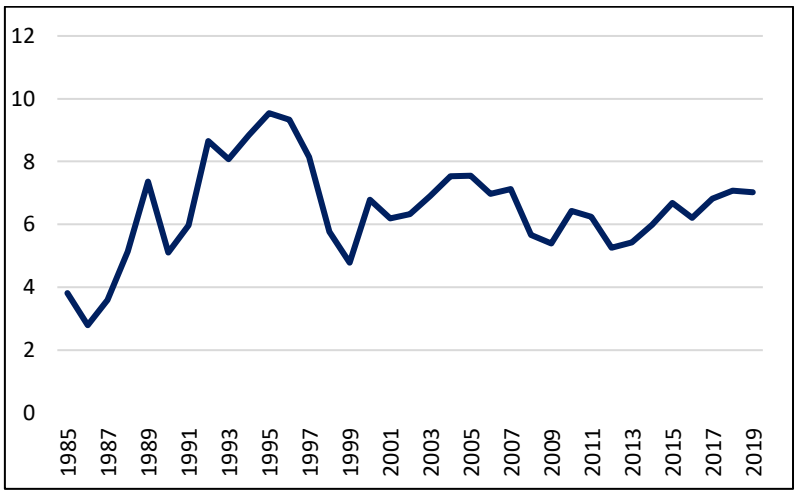


Source: World Bank WDI (2021)

After 30 years, Vietnam has gained several impressive results in economic performance, poverty reduction, and improved the standard of living of the population. Regarding the economic performance, economic growth reached 7.4% per year in the 1990s, which reduced slightly to 6.9% per year in the 2000s and at 6.2% in the 2010s. The GDPs per

capita have been improving from 95 US dollar in 1990, 390 dollar in 2000, and 2,786 dollatr in 2020. The ratio of people living below the national poverty level reduced gradually from 58% in 1993 to 20.7 % in 2010 and 6.7% in 2019[4].

Figure 2. GDP growth – Vietnam, 1985-2019.



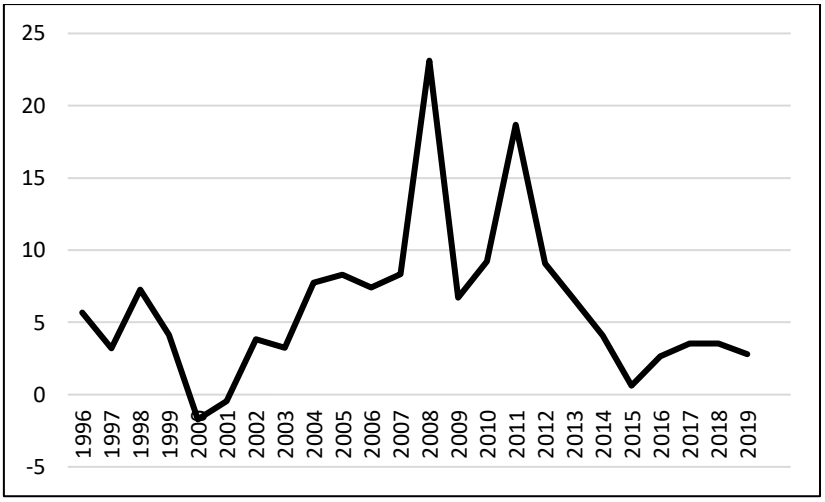
Source: World Bank WDI (2021)

Although the economy has obtained remarkable results, many challenges remain. First, inflation is high, persistent, and volatile, which has reduced the success in economic growth and eroded public confidence. While the State Bank of Vietnam (SBV) aims to achieve economic growth and stability in price levels, Vietnam has experienced high and volatile inflation, its inflation rate being the highest in Asian countries in recent years (IMF, 2006; Bhattacharya, 2014). Past studies such as Goujon (2006) demonstrated that Vietnam remained a highly dollarized economy and that inflation was affected by variations in the exchange rate and an excess of the money supply.

Second, the level of the exchange rate, despite huge nominal devaluation in the last decades, is usually considered as being overvalued. The value of the Vietnam dong is usually imposed at a high value compared to currencies of trading partners which reduces the relative competitiveness of domestic goods.

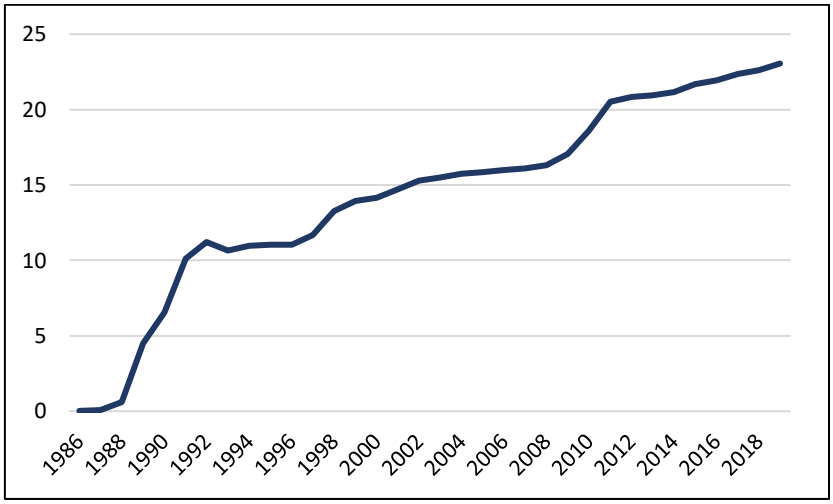
[4] Data of the economic growth are collected from IFS (IMF); the GDP per capita and the poverty ratio are from the World Bank.

Figure 3. CPI inflation (%) – Vietnam, 1996-2019



Source: World Bank WDI (2021)

Figure 4. Official exchange rate (dong per USD, period average, thousands) – Vietnam, 1986-2019.



Source: World Bank WDI (2021)

In this thesis, we will focus on analyzing the monetary policy and the exchange rate policy and their contribution to the process of economic development.

The Central Bank, The State Bank of Vietnam, represents an integral part of the Government of Vietnam that implements the monetary policy and exchange rate policy. Using methods of Grilli, Masciandaro, and Tabellini (1991) and Cukierman (1992), we

computed central bank independence indices and showed that central bank independence index of Vietnam is lower than that of other emerging countries (Vinh Van Do and Nga Thi Thuy Duong, 2014).[5] In the management of monetary policy, the State Bank of Vietnam follows monetary aggregates as an intermediate target to achieve economic growth and stability in price levels. The first question is then whether the appropriate monetary aggregate has been chosen to achieve the stability of the price level, which leads to exploring the characteristics and stability of money demand. Regarding the exchange rate policy, the regime of managed floating that has been adopted leads to question the cause of the dynamics of the exchange rate and whether the level is near the equilibrium level that would ensure the competitiveness of the domestic goods against those of trading partners.

Exchange rate regimes of Vietnam

According to the classification of International Monetary Fund's exchange rate regimes, Vietnam followed,

- multiple exchange rates (before 1989);
- crawling bands (1989-1990);
- pegged exchange rate within horizontal bands (1991-1993);
- conventional fixed peg arrangement (1994-1996);
- crawling bands (1997-1998);
- conventional fixed peg arrangement (1999-2000);
- crawling peg (2001-2007);
- crawling bands (2008-2011);
- conventional fixed peg arrangement (2012-2015).

This thesis includes three chapters. Chapter 1 presents the determinants of a function of money demand in Vietnam in the period from January 2000 to December 2016. The relationship between the nominal and the black exchange rates from January 2000 to

[5] See Vinh Van DO and Nga Thi Thuy DUONG. (2014). Measuring Central Bank Independence in Vietnam (in English), Journal of Economics and Development, Vol.16, No.1, April 2014, pp. 40-59.

December 2015 is discussed in chapter 2. The last chapter determines the disequilibrium of the real exchange rate in the period of 1990-2016.

In chapter I, we present the framework of the monetary policy in Vietnam. We investigate functions of money demand employing various monetary aggregates in order to find an appropriate one that would be used by the State Bank of Vietnam to achieve stability of price level. A stable function of demand for money is a pre-requisite to conducting an effective monetary policy, specifically in countries that follow a monetary targeting framework. The determination of a money demand function, which usually links a monetary aggregate to a measure of real economic transactions or income and to opportunity costs of holding money, informs about a relative rate of expansion between the monetary aggregate and income in the long term. Consequently, the impacts of the money supply on the real economy can only be understood and predicted if the money demand function is stable.

According to Oomes and Ohnsorge (2005), money demand is generally unstable in dollarized economies and then it makes challenging to forecast and control inflation. The arguable questions are (i) what are the variables that define the money demand function in Vietnam (ii) whether the monetary expansion affects the inflation rate and (iii) whether the monetary policy based on monetary targeting is efficient to stabilize the price level for this country.

While the determinants of money demand have been the subject of a large number of empirical works until now, there are a few studies studying the case of Vietnam, for example, Adam et al (2004), Goujon (2006), Lai (2013), Diu and Pfau (2014). Because of the difference in terms of purposes, periods, and empirical approaches, results can differ across these studies.

We therefore investigate the money demand function for Vietnam applying a standard VECM approach. We shortly recall macroeconomic performance and the monetary policy framework in Vietnam, present a review of the literature, and specify an empirical model for estimating money demand that is tested using monthly data over the period from January 2000 to December 2016.

Chapter II explores the relationship between the official exchange rate and the black exchange rate in Vietnam. We present the exchange rate policy and the cause of the emergence of a parallel foreign exchange in developing economies in Vietnam, and analyze the dynamics of the official exchange rates and of the black foreign exchange rates. We then develop an empirical model to test this relationship between both rates, giving insight into the way in which the State Bank of Vietnam conducts the exchange rate policy.

Exchange rate management remains a key challenge in economic development strategies for developing countries' integration in the globalization process (Eichengreen, 2007). Avoiding local currency overvaluation, if not applying undervaluation, remains an imperative, particularly for open economies where competitiveness, growth, and inflation are greatly affected by the changes in the exchange rate. Overvaluation would hamper, while undervaluation would accelerate growth (Gala, 2008, Couharde and Sallenave, 2013, Rodrik, 1986, 2008). Therefore, identifying the appropriate level of exchange rate remains until now a challenging task for countries pursuing a managed or pegged exchange rate policy.

In countries where the pegged official exchange rate is overvalued and the balance of payments deficit is persistent despite various administrative controls, an illegal market (a black market) for foreign exchange can develop and play an important role, even for the official exchange rate policy (Edward, 1989; Agenor, 1992; Montiel, Agenor and Ui Haque, 1993; Agenor and Taylor, 1993; Kiguel and O'Connel, 1995; Phylaktis and Kassimatis, 1997; Diamandis and Drakos, 2005).

Since the early 1990s, the Vietnamese dong exchange rate has usually been pegged to the US dollar (USD) in periods of macroeconomic stability, while it has been depreciated with more adjustment in periods of instability (Vo et al, 2000; Phuc and Duc-Tho, 2009; Nguyen et al, 2010).

Foreign exchange transactions in Vietnam coexist in an official market and black markets. The official market is a market where foreign exchange transactions are carried out between commercial banks and their final customers, with an interbank market between authorized commercial banks and credit institutions, where the central bank, the State Bank of Vietnam, intervene to determine the level of the official exchange rate.

Outside-banks foreign exchange transactions between domestic firms and/or individuals are legally prohibited but are rather tolerated, if not ignored, by authorities, leaving room for the development of black markets. However, Vietnamese authorities have remained silent about the importance and the role of the black markets, while there is evidence showing that black market transactions are not anecdotal.

The question we focus on is whether the black market plays a role in the official exchange rate policy; or whether the black market represents only a residual market that is influenced by the events occurring in the official market. The mutual influence that both markets may have each other depends on very specific conditions, such as the relative size of both markets, the porosity between them, and whether actors on one market observe and utilize the information on the supply-demand disequilibria that are reflected in the change in the exchange rate in the other market. This question is relative to discussion about market efficiency or informational efficiency.

In an attempt to respond to these questions, we investigate the relationship between the black and official exchange rates in Vietnam over the 2000-2015 period with monthly data. We apply a cointegration analysis developed by Johansen (1995) and a vector error correction model (VECM) specification that allows us testing for the exogeneity of exchange rates and revealing the long and short-run relationships between both exchange rates.

In the Chapter III, we investigate the long-run determinants of the real effective exchange rate and the presence of a disequilibrium of the real exchange rate in Vietnam.

Regarding exchange rate management issues, the *real* exchange rate (RER) is conventionally considered as the central variable in theoretical and empirical works. It is a measure of competitiveness in the production of tradable goods and services of a country compared with its trading partners. However, the concepts and the measures of the RER remain challenging in empirical works, particularly for those covering developing economies (Edwards, 1988; Hinkle and Montiel, 1999). The external RER is the nominal exchange rate adjusted for the relative prices between the domestic and foreign countries and is the usual variable to estimate the so-called equilibrium RER level

and misalignments (undervaluations or overvaluations) which are an important issue in macroeconomic management.

The assessment of RER misalignment in Vietnam has only been studied by a few works. The RER is often considered as overvalued, weakening the country's competitiveness in international trade (Nguyen and Nguyen, 2009; Nguyen et al, 2010). However, Bui et al. (2017) in a recent econometric estimate of the equilibrium RER and misalignment show that the misalignment of the RER is not durable and varies over time. Therefore, the question of RER misalignment is still a timely issue, particularly for Vietnamese authorities that would target a good level of the RER.

Since the RER for Vietnam is not published in international databases, we first compute different measures of bilateral and multilateral RER for Vietnam against its main trading partners using monthly data over 1999-2017. We then examine the well-known hypothesis of the purchasing power parity based on unit-root and cointegration tests.

We also construct an empirical model to investigate the equilibrium real exchange rate based on the hypothesis of the "Balassa-Samuelson effect". However, because of a lack of quarterly and monthly series of the fundamentals, we use annual series of the REER over 1990-2016 that come from a database produced by the CERDI. The long run relationship between the RER and its fundamentals is explored through the estimates of a VECM and cointegration tests.

References

Adam, C., Goujon, M., & Jeanneney, S. G. (2004). The transactions demand for money in the presence of currency substitution: evidence from Vietnam. *Applied Economics*, *36*(13), 1461-1470.

Agénor, P. R. (1990). Parallel currency markets in developing countries: theory, evidence, and policy implications. *IMF Working Paper*, Vol., pp. 1-52, 1990.

Agénor, P-R., and Taylor, M.P. (1993). The causality between official and parallel exchange rates in developing countries. *Applied Financial Economics* 3.3: 255-266.

Bhattacharya, R. (2014). Inflation dynamics and monetary policy transmission in Vietnam and emerging Asia. *Journal of Asian Economics*, *34*, 16-26.

Bui, D.H., Makin, A.J., and Ratnasiri, S. (2017). Is Vietnam's exchange rate overvalued? *Journal of the Asia Pacific Economy*, 22:3, 357-371.

Couharde, C., & Sallenave, A. (2013). How do currency misalignments' threshold affect economic growth?. *Journal of Macroeconomics*, *36*, 106-120.

Cukierman, A. (1992). *Central bank strategy, credibility, and independence: Theory and evidence*. MIT press.

Diamandis, P. F., & Drakos, A. A. (2005). Long-run dynamics of official and black-market exchange rates in Latin America. *Global Finance Journal*, *15*(3), 219-237.

Diu, N. H., & Pfau, W. D. (2010). The Determinants and Stability of Real Money Demand in Vietnam, 1999-2009. *GRIPS Policy Research Center, discussion paper*, 10-14.

Edwards, S. (1988). Real and monetary determinants of RER behavior: Theory and evidence from developing countries. *Journal of development economics*, *29*(3), 311-341.

Eichengreen, B. (2007). The Real Exchange Rate and Economic Growth. *Social and Economic Studies,* 56, 4, p.7-20.

Gala, P. (2007). RER levels and economic development: theoretical analysis and econometric evidence. *Cambridge Journal of economics*, 32(2), 273-288.

Grilli, V., Masciandaro, D., & Tabellini, G. (1991). Political and monetary institutions and public financial policies in the industrial countries. *Economic policy*, *6*(13), 341-392.

Goujon, M. (2006). Fighting inflation in a dollarized economy: The case of Vietnam. *Journal of comparative economics*, *34*(3), 564-581.

Hinkle, L. E., & Monteil, P. J. (1999). Exchange rate misalignment: Concepts and measurement for developing countries. *Oxford University Press*.

IMF. (2006). IMF country report No. 06/421.

Kiguel, M., & O'Connell, S. A. (1995). Parallel exchange rates in developing countries. The *World Bank Research Observer*, 10(1), 21-52.

Lai, Ngoc-Anh, Is Money Demand in Vietnam Stable? Application of the Bounds Testing Approach (February 25, 2013). *25th Australasian Finance and Banking Conference 2012*. Available at: SRN: https://ssrn.com/abstract=2101111 or http://dx.doi.org/10.2139/ssrn.2101111

Nguyen, T.T.H., & Dinh, T.M., & To, T.T., & Le, H.G., and Pham, V.H. (2010). Vietnam annual report 2010: The choice for sustainable growth - Chapter 4. *Nhà Xuất Bản Tri thức*, Hà Nội, 6/2010 (in Vietnamese). Link: http://dl.ueb.vnu.edu.vn/bitstream/1247/52/2/NC-21.pdf

Montiel, P.J., P-R Agenor and N. Ul Haque. (1993). Informal Financial Markets in Developing Countries. *Oxford: Blackwell Publishers*, 26-41.

Oomes, N., & Ohnsorge, F. (2005). Money demand and inflation in dollarized economies: The case of Russia. *Journal of Comparative Economics*, *33*(3), 462-483.

Phuc, N. T., & Duc-Tho, N. (2009). Exchange rate policy in Vietnam, 1985–2008. *ASEAN Economic Bulletin*, *26*(2), 137-163.

Phylaktis, K., & Kassimatis, Y. (1997). Black and official exchange rate volatility and foreign exchange controls. *Applied Financial Economics*, *7*(1), 15-24.

Rodrik, D. (1986). Disequilibrium Exchange Rates as Industrialization Policy. *Journal of Development Economics*, 23(1), September 1986.

Rodrik, D. (2008). The Real Exchange Rate and Economic Growth. *Brooking Papers on Economic Activity*, fall, 2, p.365-412.

Vinh Van DO and Nga Thi Thuy DUONG (2014) Measuring Central Bank Independence in Vietnam (in English), Journal of Economics and Development, Vol.16, No.1, April 2014, pp. 40-59.

Vo, T.T., Dinh, H.M., Do, X.T., Hoang, V.T., and Pham, C.Q. (2000). Exchange rate arrangement in Vietnam. *East Asian Development Network*, December 2000.

CHAPTER I.

DETERMINANTS OF MONEY DEMAND IN VIETNAM

INTRODUCTION

A stable function of demand for money is a pre-requisite to conducting an effective monetary policy, specifically in countries that follow a monetary targeting framework. The determination of a money demand function, usually links a monetary aggregate to a measure of real economic transactions or income and to opportunity costs of holding money, informs about a relative rate of expansion between the monetary aggregate and income in the long term. Consequently, the impacts of the money supply on the real economy can only be understood and predicted if the money demand function is stable.

The State Bank of Vietnam (SBV) follows monetary aggregates as an intermediate target of monetary policy to achieve economic growth and stability in price levels. Therefore, the efficiency of this policy depends on well-specified determinants of money demand and the stability of the money demand function. The economic growth was high at an average of 7.4 % in the 1990s and at 6.9 % in the 2000s. However, Vietnam has experienced high and volatile inflation, its inflation rate being the highest in Asian countries in recent years (IMF, 2006; Bhattacharya, 2014). In addition, past studies such as Goujon (2006) demonstrated that Vietnam remained a highly dollarized economy and that inflation was affected by variations in the exchange rate and an excess of the money supply. According to Oomes and Ohnsorge (2005), money demand is generally unstable in dollarized economies and then it makes challenging to forecast and control inflation. The arguable questions are (i) what are the variables that define the money demand function in Vietnam (ii) whether the monetary expansion affects the inflation rate and (iii) whether the monetary policy based on monetary targeting is efficient to stabilize the price level for this country.

While the determinants of money demand have been the subject of a large number of empirical works until now[6], there are a few studies studying the case of Vietnam, for example, Adam et al (2004), Goujon (2006), Lai (2013), Diu and Pfau (2014). Because of the difference in terms of purposes, periods, and empirical approaches, results can differ across these studies.

This paper, therefore, investigates the money demand function for Vietnam over the period from January 2000 to December 2016 applying a standard VECM approach. This study is organized as follows. After this introduction section, section I.1 shortly presents macroeconomic performance and the monetary policy framework in Vietnam, section I.2 reviews literature, section I.3 specifies an empirical model for estimating money demand, section I.4 presents the data. Then, section I.5 gives results and the last conclusion section.

I.1. ECONOMIC PERFORMANCES AND THE MONETARY POLICY IN VIETNAM

The reform programme from a centrally planned model to a market-oriented economy called *"đổi mới"* was launched in Vietnam in 1986. Its primary objectives were to stabilize the economy, to encourage investments and exports, and to boost economic growth. Since then Vietnam has integrated more deeply and widely into the regional and the world economy. The success of this process has brought impressive results in macroeconomic performances (IMF country reports for Vietnam, several years).

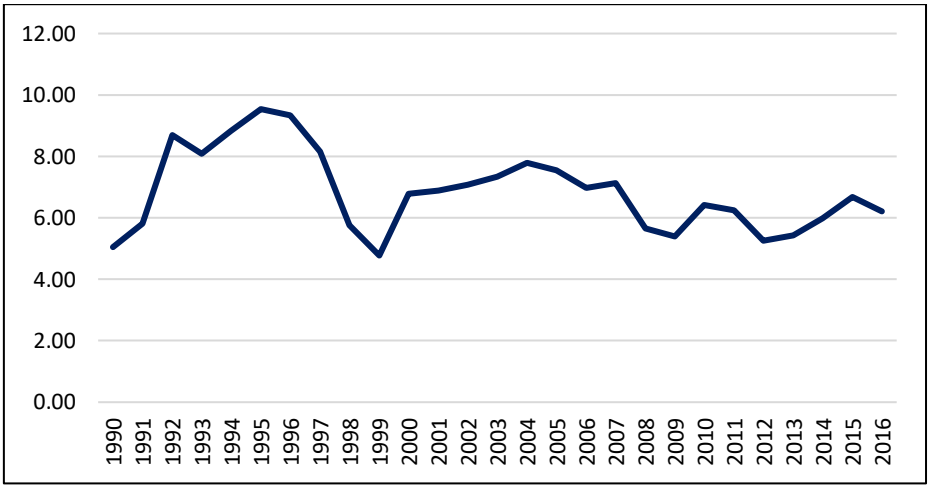
Economic growth and inflation

The economy has significantly developed during the 1990s. The economic growth achieved an average rate of 8.8% per year over 1992-1997, driven by foreign direct investment inflows from neighboring Asian countries and export sectors following the

[6] In the context of developing and emerging countries, several studies have been conducted recently: for instance, Dahalan et al (2007) and Obben (1998) for Brunei; Nwaobi (2002) and Akinlo (2006) for Nigeria; Sriram (2002) for Malaysia; Pradhan and Subramanian (2003) for India; James (2005) for Indonesia; Oomes and Ohnsorge (2005) for Russia; Bahmani-Oskooee and Economidou (2005) for Greece; Cziráky and Gillman (2006) for Croatia; Baharumshah et al (2009), Wu (2009), Lee and Chien (2008) for China; Hossain (2010) for Bangladesh; Dagher and Kovenan (2011) for Ghana.

reform program. However, the Asian crisis adversely affected the Vietnamese economy with a drop in growth at approximately 5% per year in 1998 and 1999. The economic growth recovered an increasing trend in the 2000s led by a rebound of exports, along with the support of a loose monetary policy (the growth rate of broad money supply was 66% in 1999 and 36% in 2000). The economic growth was at an average rate of 7.3% per year over 2000-2007 led by agricultural production, expanding state-owned enterprise investment, financial services, and foreign direct investment into labor-intensive manufacturing. However, the 2008 global financial crisis severely affected the domestic economy, lowering economic growth rates to 5.6% in 2008 and 5.4% in 2009. Since then, the rate of economic growth slows down at 5-6% per year during 2010-2016.

Figure I.1. Economic growth 1992-2016 (% per year)

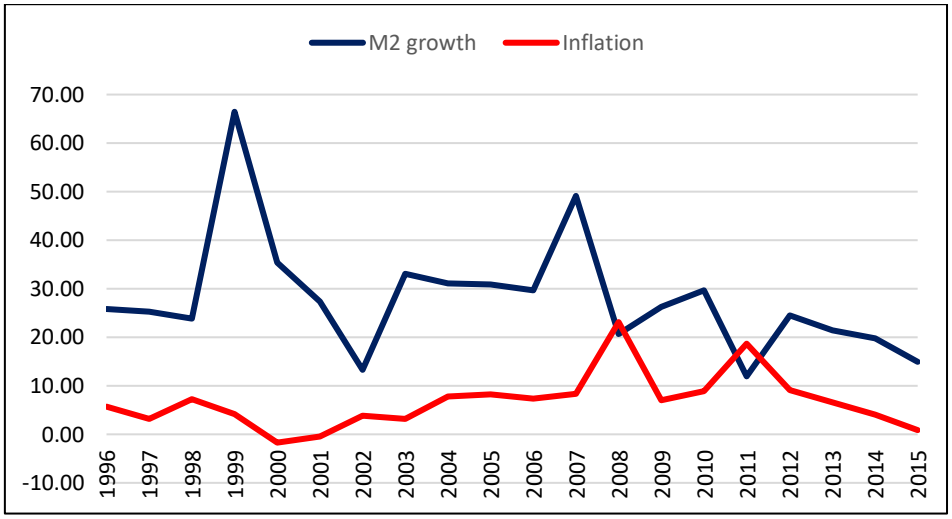


Source: International Financial Statistics (IMF)

Although the Vietnamese economy obtained impressive results, it experienced volatile inflation. Thanks to successful policies of the State Bank of Vietnam (SBV), the inflation has dropped from hyper-inflation to double-digit levels at the beginning of the 1990s and to single-digit levels since 1996. Following the Asian crisis, Vietnam experienced deflation in 2000 and 2001 when internal and external demands weakened. The inflation rate was moderate in 2001-2006 at an average of 5-6% per year. In anticipation of WTO accession in early 2007, a large amount of capital flowed into Vietnam and the domestic credit growth increased rapidly (the growth of broad money supply reached 50% in 2007). As a consequence, the inflation rate increased strongly and reached 23% in 2008. The

inflation diminished at 8-9% in the next two years following the global financial crisis and economic slowdown. The authorities responded by carrying out a large fiscal stimulus and a loosen monetary policy in 2009 and 2010. The economic growth restored in the short-run, at 6% in 2010, but inflation rose to more than 18% in 2011. In the next years, inflation reduced to a single-digit level when authorities implemented stabilization policies. In a brief overview of the inflation process in Vietnam, IMF (2006) shows that it is higher in Vietnam than in many other Asian developing countries such as China, the Philippines, Thailand, and Malaysia. Bhattacharya (2014) also asserts that the inflation in Vietnam is persistently higher than in most other emerging market economies in the region including China, India, Sri Lanka, Thailand, Philippines, Malaysia, and Indonesia.

Figure I.2. The growth of money (M2) and inflation rate (% per year)



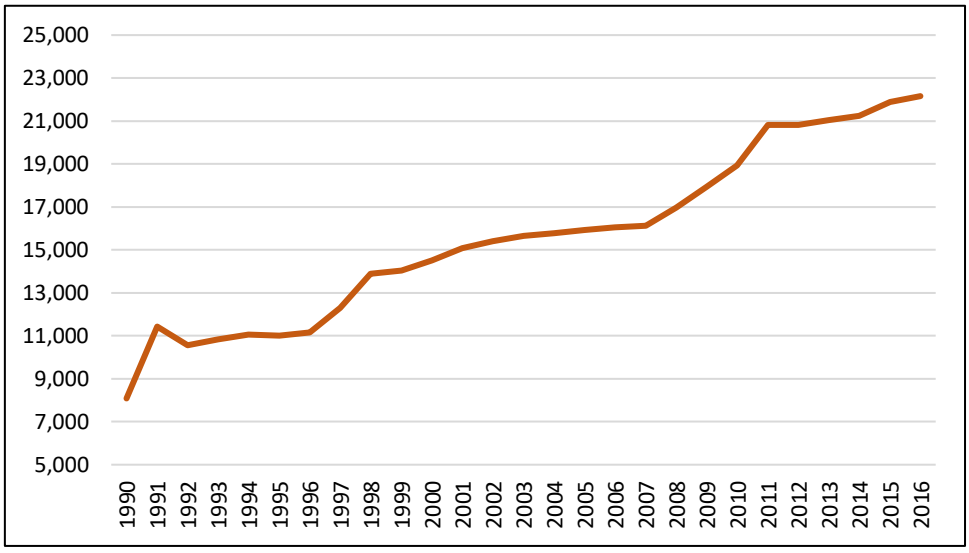
Source: International Financial Statistics (IMF)

Exchange rate regime

Since the 1990s, the Vietnamese authorities have adopted a stable exchange rate regime and pegged the Vietnamese *dong* to the United States dollar, as an effort to control inflation, to recover public confidence in the value of the domestic currency, and attract foreign direct investment. The official exchange rates slightly fluctuated around the level of 11,000 VND/USD over 1993-1997. While this stable exchange rate played a crucial role in controlling inflation, in promoting domestic currency deposits, and rising foreign direct investment, it was also a source of a rising trade deficit in the mid-1990s. The

reduction in capital inflows during the Asian crisis put pressure on current account operations and then the dong was depreciated. The official exchange rate rose from 11,000 to 14,000 VND/USD in 1997-1999 (a depreciation of 24%). The exchange rate was maintained around the level of 15,000 VND/USD over 2003-2008. Nevertheless, the exchange rate depreciated again by about 25% from 17,000 to 20,500 VND/USD in 2009-2011 as a consequence of the global financial crisis, which diminished FDI inflows and exports. Since 2012, the official exchange rate was kept stable at 21,000 VND/USD.

Figure I.3. Nominal exchange rate (VND/USD)



Source: International Financial Statistics (IMF)

Monetary policy framework

The Vietnamese authorities have used monetary aggregates as intermediate targets for monetary policy. To influence the money supply, the SBV's instruments include open market operations, reserve requirements, refinancing, and discount lending facilities.

Reserves requirements remain an essential instrument of the SBV. The SBV imposed a ratio of reserve requirements on dong deposits at 3% for the maturity of less than one year and at 1% for the maturity of more than one year since March 2009. Simultaneously, the reserve requirements ratios on foreign currency deposits are at 8% for the maturity of less than one year and at 6% for the maturity of more than one year since September 2011.

The SBV lends to and borrows from commercial banks through its lending facilities including a refinance and discount facility. The discount and refinance rates are imposed at 4.5% and at 6.5% per year since March 2014.

The SBV established open market operations since July 2000, in the form of outright sales and purchases of securities or repurchase agreements. Buying and selling of securities are performed through auctions by volume or by an interest rate. Government securities, SBV bills, and some other securities that were selected by the SBV are commonly the transacting securities. Since 2003, investors can buy and sell securities having a maturity of more than one year.

The SBV usually intervenes in the foreign exchange market through buying and selling foreign currencies.

Regarding the operations of the SBV since the 2000s, Camen (2006) shows that open market operations are limited by the thin money market and the lack of financial instruments. Pham and Riedel (2012) also document the absence of a liquid secondary market for government bonds. Therefore, the SBV uses its lending facilities to adjust the monetary base and required reserve ratios to change money multipliers. In addition, several authors argue that commercial banks hold excess reserves that make the ratio of the required reserve useless.

Then, since the 2000s, Vietnam has been hurt by different shocks and has experienced volatile macroeconomic conditions. Monetary and exchange rate policies also have evolved and showed different stances. The money demand function may, therefore, have been destabilized during this period, casting doubt on the ability to use monetary aggregates as an efficient monetary target for the authorities.

I.2. LITERATURE REVIEW

Because of the importance of this analysis for monetary policy, various empirical works on money demand cover developed and developing countries. In this study, we pay attention to the works on developing countries, particularly in Asian countries, to drawn lessons for our analysis of Vietnam.

Authors use different estimators and test different definitions of money (from M1 composed of currency in circulation and demand deposits, M2 composed of M1 plus saving deposits, and more rarely M3 that include M2 and longer term deposits and assets).

Obsen (1998) estimates the money demand function for Brunei in the period 1974-1995 using error-correction models. He finds that narrow money M1 has a long-run relationship with a real income, interest rate, and price index. Nwaobi (2002) examines the money demand function in Nigeria applying a vector error-correction model (VECM) with annual data from 1960 to 1995. He finds that M1 is cointegrated with real GDP, interest rate, and price level. Akinlo (2006) re-examines the money demand in Nigeria using quarterly data from 1970:1 to 2002:4 applying the Autoregressive distributed lag (ARDL) approach. He finds that M2 is cointegrated with real GDP, interest rate, and exchange rate. Sriram (2002) analyzes M2 in Malaysia using monthly data from 1973:8 to 1995:12 employing error-correction models (ECM). He finds that M2 has a long-run relationship with a real income, its own rate, and the expected inflation rate. Inoue and Hamori (2008) investigate a function of money demand for India from 1980 – 2007 with monthly data applying the cointegration approach. They find that M1 and M2 are cointegrated with real income and interest rate but not the larger aggregate M3 that is not a relevant alternate variable for the function of money demand in the studied period. Dagher and Kovanen (2011) examine the stability of money demand in Ghana in the period 1990Q1 – 2009Q4 applying a cointegration approach. They find that the determinants of money demand are real income and exchange rate. Zannah et al (2017) analyze the money demand from January 2006 to July 2016 in India applying the ARDL method. They find that both narrow money and broad money are cointegrated with income, exchange rate, and inflation rate. Narayan et al (2009) estimate the money demand functions for South Asian countries including Bangladesh, India, Pakistan, Sri Lanka, and Nepal in the period 1974-2002 using the Ordinary Least Square approach. They find that M2 aggregates are cointegrated with real income, real exchange rate, short-term domestic and foreign interest rates for these countries in the studied period. James (2005) investigates the relationship between money demand and financial liberalization in Indonesia using the quarterly data from 1983Q1 to 2000Q4. He finds that the money demand has a long-run relationship with a real income, domestic interest rate, and foreign interest rate in the studied period. Bahmani-Oskooee and Economidou (2005) examine the stability of

money demand for Greece using the quarterly data 1975:Q1–2002:Q4 employing a cointegration approach. They find that the monetary aggregates M1 and M2 have a long-run relationship with income and interest rate. Cziráky and Gillman (2006) apply the VECM to determine the money demand function for Croatia using monthly data from 1994:4-2002:8. They find that the money demand is cointegrated with income, inflation rate, and interest rate. Baharumshah et al (2009) estimate the money demand in China from 1994:Q4 – 2007:Q2 applying the ARDL cointegration approach. They find that the function of money demand M2 includes real income, inflation rate, foreign interest rate, and stock prices. Hossain (2010) surveys the monetary targeting for the price stability for Bangladesh using the annual data from 1973 to 2008 applying a cointegration approach. He finds that the broad money demand has a long-run relationship with a real income, domestic and foreign interest rates, and nominal effective exchange rate in the studied period. Dagher and Kovenan (2011) examine the stability of money demand in Ghana from 1990:Q1-2009:Q4 employing the cointegration approach. They find that the money demand is cointegrated with real income and exchange rate.

Regarding the case of Vietnam, the researches about money demand are still limited. Goujon (2006) analyzes inflation in Vietnam in the 1990s using monthly data applying cointegration techniques. He finds that the demand function for narrow money M2D (M2 excluding foreign currency deposits) includes a real income, the expected inflation rate, and the depreciation of exchange rate in the studied period. Lai (2013) examines the money demand function in Vietnam using quarterly data in the period 1999:Q2-2011:Q3 applying the cointegration approach. He finds that the money demand M1 is cointegrated with real GDP, expected inflation rate, exchange rate, and gold price while money demand of M2 and M2D are cointegrated with real GDP, expected inflation rate, exchange rate, gold price, and stock price. Diu and Pfau (2014) estimate a function of money demand in Vietnam using quarterly data from 1999Q1 - 2009Q2 applying a cointegration approach. They find that the demand of domestic currency is cointegrated with real GDP, foreign interest rate, and real stock price.

While the authors may use different estimators, published studies on money demand are still dominated by cointegration approaches testing for a long-run relationship between monetary aggregates and a vector of determinants that include a scale variable, the own rate on deposits included in the monetary aggregate and a range of opportunity costs of

holding money. A well-defined demand for money function is often found for narrower aggregates M1 and M2, more rarely for broader aggregates M3.

I.3. A MODEL OF MONEY DEMAND

An empirical model of real money demand is traditionally based on a functional relationship such as,

$$\frac{M}{P} = f(Y, \Omega) \qquad (1)$$

where M is nominal money aggregate and P is price level. The demand for real monetary aggregate ($\frac{M}{P}$) is a function of a scale variable (Y) relating to real economic activities and a vector of opportunity cost variables (Ω).

Selections of variables in the model (1) vary amongst studies following both theoretical and empirical arguments (Sriram, 2000). The money aggregates can be either narrow money or broad money. In developing economies with an underdeveloped financial sector and a fragile banking system, narrow money is usually preferred because a more stable link with determinants is expected. In the case of Vietnam where the money and financial markets are still thin and segmented, the secondary markets for government bonds are illiquid (Camen, 2006; Pham and Riedel, 2012). Therefore, this paper focusses on the monetary aggregate of domestic currency to evaluate a function of money demand.

The scale variable to proxy real economic activities is represented by real GDP or real income, or industrial output.

The own-rate of monetary assets is usually measured by a short-term interest rate. Alternative assets to money are financial assets and/or real assets under a portfolio balance approach. The rate of return on real assets is usually represented by an expected inflation rate, but it is not the only choice in empirical studies of the money demand function. Choudhry (1995) asserts that the expected inflation rate is an important variable in the model of money demand, particularly in countries experiencing high inflation

rates[7]. Sriram (2002) also shows that the expected inflation rate is a crucial variable in estimating the money demand in Malaysia. Bahmani-Oskooee and Redman (2005) state that the inflation rate is a proxy for the opportunity cost of holding money due to an absence of well-developed financial markets in Asian economies.

The literature on currency substitution shows that, in high inflation economies, domestic currencies could be replaced by the foreign currency for the functions of a unit of account and/or a store of value (dollarization), and later as a mean of exchange (currency substitution) (Calvo and Vegh, 1992). Foreign currency holdings are influenced by the expected change in the exchange rates. There are several empirical works that find an important role of exchange rate variables in the money demand function (Choudhry, 1995; Akinlo, 2005; Oomes and Ohnsorge, 2005; Bahmani-Oskooee and Tanku, 2006; Hossain, 2010; Dagher and Kovenen, 2011; and Adam et al, 2004, on Vietnam).

In the case of Vietnam where the money and financial markets are still underdeveloped and illiquid, real assets are an actual alternative to money. Furthermore, inflation rates are high and volatile. This suggests that both the expected inflation rate and the expected depreciation of exchange rate should be included in a model of money demand as the opportunity costs of holding money.

A money demand function for Vietnam could be as follows,

$$\frac{M}{P} = f(Y, r, \Delta p, \Delta e) \qquad (2)$$

where M is the monetary aggregate, P is the price level, Y is the real income, r is the short-term interest rate, Δp is expected inflation rate, and Δe is expected depreciation of exchange rate.

In empirical work, the long-run money demand function (2) usually takes a semi-logarithm form,

$$(m - p)_t = \beta_0 + \beta_1 * y_t + \beta_2 * r_t + \beta_3 * \Delta p_t + \beta_4 * \Delta e_t + \alpha_t \qquad (3)$$

[7] Friedman (1956) asserted that money demand model needs containing inflation expectation, arguing that physical goods could consider as substitution for money, hence, higher expected inflation could lead to a shift from money to real assets.

where m=logarithm (M), p=logarithm (P), y=logarithm (Y).

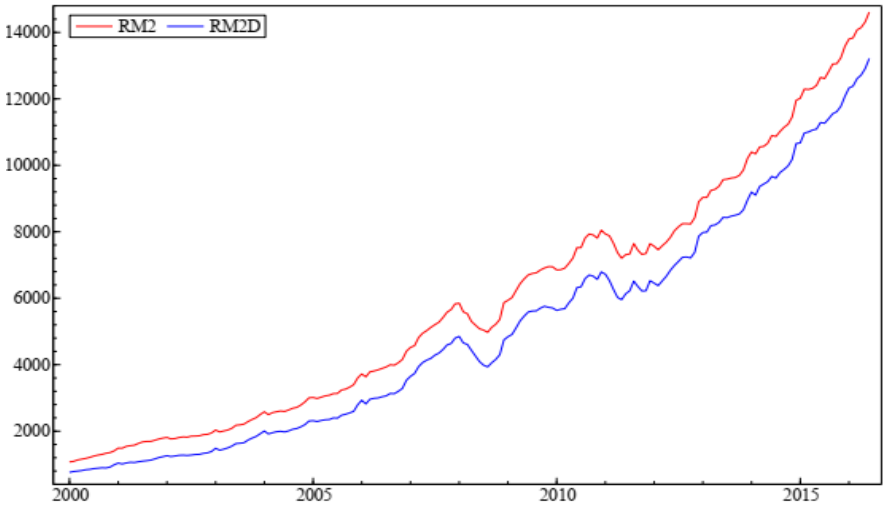
I.4. DATA

In this paper, we employ monthly data from January 2000 to December 2016 to test for a money demand function. January 2000 is chosen as the starting point of the post-Asian crisis period and for a possible new monetary regime.

The monetary aggregates that can be a priori relevant in Vietnam are the aggregate of the domestic currency (M2D), that includes the dong in circulation outside banks and the dong demand deposits in the banking system, and a broader monetary aggregate (M2) composed of M2D plus foreign currency deposits. M2 is often considered in conducting monetary policy in Vietnam, given the partial dollarization of the banking system and an expected stronger link with real transactions (and eventually inflation). However, foreign currency deposits have a share of only 13.6% in M2 over 2000-2016 and M2 does not include dollar currency in circulation outside banks. It would also show a weaker link with the opportunity costs of holding money, since it includes both non-hedging and hedging assets. Contrastingly, M2D could display a more stable relationship with money demand determinants and would be easier to follow by the authorities. This is why we test for a money demand function for both M2 and M2D.

Figure I.4 presents the real M2 and M2D in the period of 2000-2016. The real M2 and real M2D are calculated as the M2 and M2D divided by the CPI (real M2 = M2/CPI and real M2D = M2D/CPI). The real M2 and M2D exhibit a similar trend, due to a seemingly stable share of foreign currency deposit, starting to rapidly grow up since 2007.

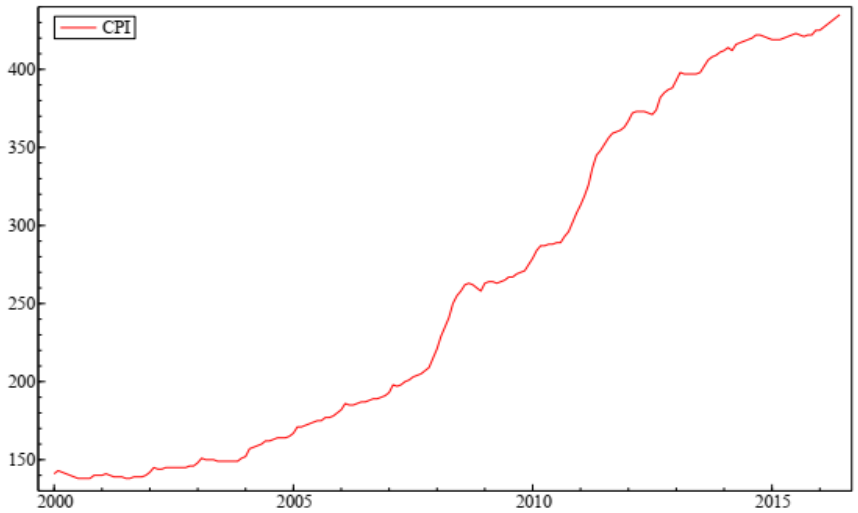
Figure I.4. Real M2 and real M2D, 2000-2016 (billion dong)



Source: International Financial Statistics (IMF)

The CPI is the only available data that is published as the price level in this country. Figure I.5 presents the CPI in the period 2000-2016. The CPI also displays seasonal characteristics; it significantly increases at the end and beginning of each year relating to boiling economic activities on the eve and during the lunar new year period.

Figure I.5. The consumer price index 2000-2016 (1994=100)

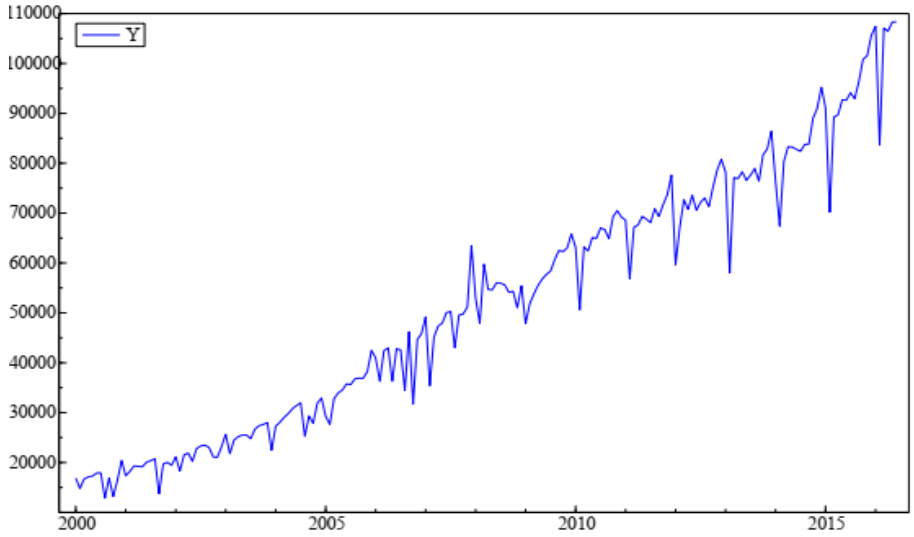


Source: General Statistics Office of Vietnam.

The industrial output is employed as a preferred proxy for the scale variable due to the unavailability of monthly GDP data. The industrial output was also used by several researchers when studying the Vietnamese economy based on monthly data [Adam et al.

(2004), Goujon (2006), Vo (2009), Le and Nguyen (2011), Nguyen et al. (2012), Elgammal and Eissa (2016)]. Figure 6 presents the industrial output in the period of 2000-2016. The graphics show that industrial output follows a long-term trend with seasonality (rising on the eve of, but dropping during, lunar new year period).

Figure I.6. The industrial output 2000-2016 (billion dong)

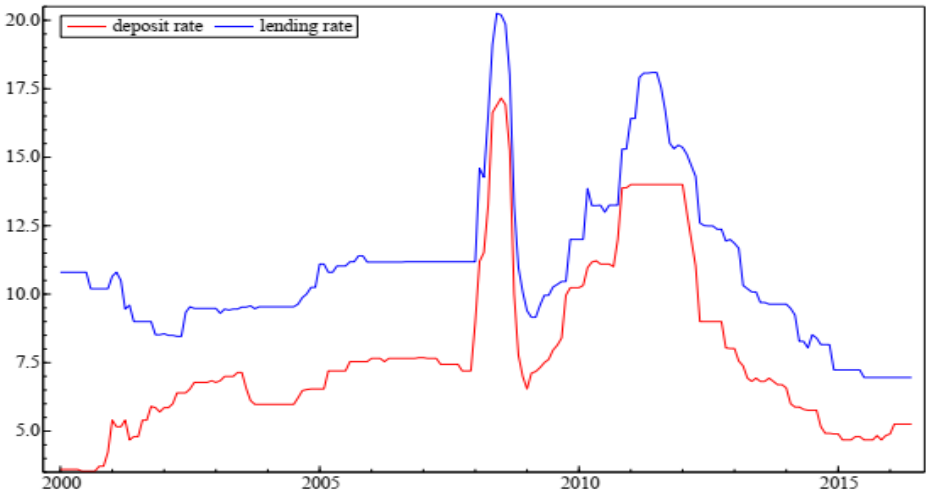


Source: General Statistics Office of Vietnam.

The short-term interest rate is measured by the (end of the period) 3-month dong-dominated deposit average rate in commercial banks. Figure I.7 presents the deposit and lending rates, that show strong fluctuations in 2008 and 2011-2012.

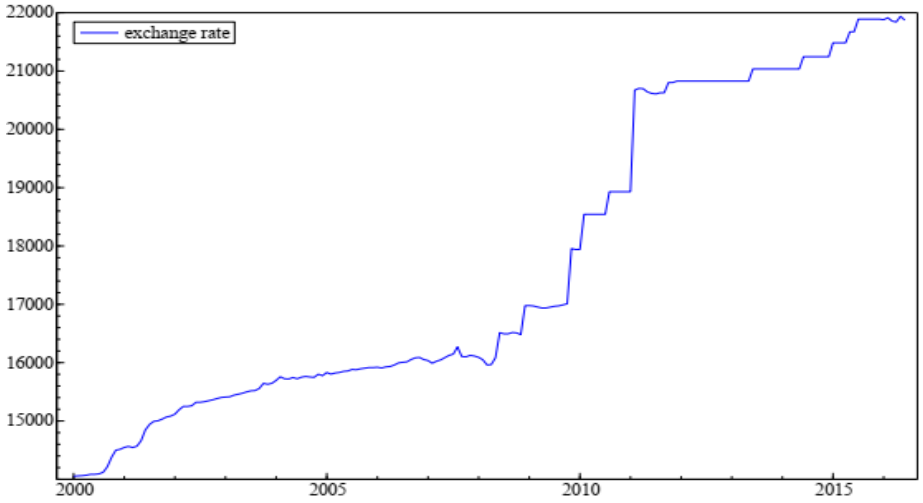
The expected depreciation of the exchange rate can be proxied as a current exchange rate (Bahmani-Oskooee and Tanku, 2006), an annualized rate of change in the exchange rate (Choudhry, 1995), or a depreciation of the exchange rate (Oomes and Ohnsorge, 2005). In this study, we use the current depreciation of the nominal exchange rate as a proxy for the expected depreciation of the exchange rate. The nominal depreciation of exchange rate is calculated as ($logEX_t - logEX_{t-1}$) where EX is the nominal exchange rate between the Vietnam dong and the United States dollar (units of Vietnam dong per 1 unit of United States dollar). Figure I.8 shows that EX strongly fluctuated in 2008-2011.

Figure I.7. The deposit and lending rates 2000-2016 (% per year)



Source: International Financial Statistics (IMF)

Figure I.8. The nominal exchange rate 2000-2016 (dong)



Source: International Financial Statistics (IMF)

As for exchange rate depreciation, the expected inflation rate can be proxied by the current inflation rate (Honohan, 1994; and Sriram, 2002). In this work, the inflation variable is calculated as ($logCPI_t - logCPI_{t-1}$).

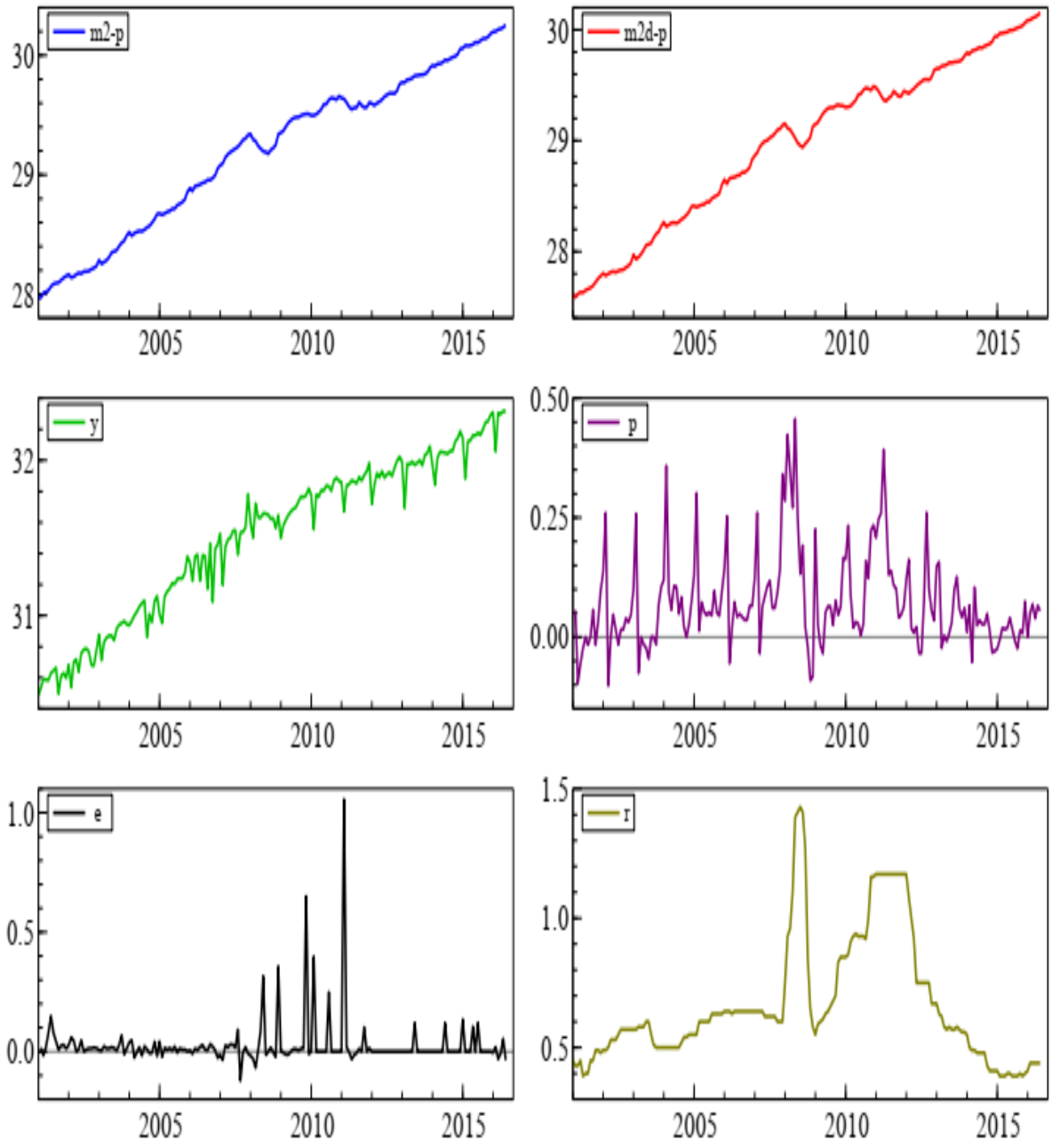
Data on monetary aggregates, interest rates, nominal exchange rates are collected from the International Financial Statistics (IMF), and data on CPI and industrial output from the General Statistics Office of Vietnam (GSO). From July 2011, GSO has published the

index of industrial output replacing the value of industrial output[8]. For this reason, we re-calculate the data of industrial output from the index of industrial output during the period from July 2011 to December 2016. The industrial output is based at 1994 constant price. The CPI is also rebased as 1994m1=100.

The variables in the equation (3) are presented in figure 9 that include the logarithm of real monetary aggregates (m2-p) and (m2d-p), the logarithm of industrial output (y), the deposit rate (r), the inflation rate (Δp), the depreciation of the exchange rate (Δe).

[8] Circular No. 07/2011/TT-BKHDT

Figure I.9. Graphs of variables (m2-p, m2d-p, y, Δe, Δp, r) used in the econometric analysis



I.5. EMPIRICAL RESULTS

First, unit root tests are performed to examine the specification of variables in the model (3). We apply the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests. A fundamental issue for the performance of unit root tests is the selection of lag

lengths. Therefore, the ADF unit root tests are carefully performed at 3, 6, 9, and 12 lags for each variable. The results of the ADF and Phillips-Perron unit root tests are reported in table I.1 and table I.2. The null hypothesis of a unit root is not rejected for all variables except the inflation rate and the exchange rate depreciation. The results of unit root tests show that (i) most of the variables are integrated at I(1), allowing a cointegration relationship to exist between them; (ii) the monetary aggregates and the industrial output do not follow a deterministic trend, but rather a stochastic trend; (iii) the variables of inflation rate and exchange rate are stationary (Johansen's cointegration analysis allows for I(0) variables to enter into the vector but they then may add to the number of I(0) cointegration vector).

Table I.1. Augmented Dickey-Fuller unit root tests.

	With trend					Without trend				
	X				ΔX	X				ΔX
	L=3	L=6	L=9	L=12	L=0	L=3	L=6	L=9	L=12	L=0
m2-p	-1.4	-1.4	-1.3	-1.3	-9.4**	-2.4	-2.2	-1.9	-1.7	-9.4**
m2d-p	-1.3	-1.3	-1.3	-1.3	-9.2**	-2.1	-1.9	-2.1	-1.6	-9.1**
y	-2.6	-2.6	-2.6	-2.6	-25**	-1.4	-1.4	-1.8	-1.5	-25**
Δe	-13**	-13**	-13**	-13**	-22**	-13**	-13**	-13**	-13**	-22**
Δp	-5.8**	-5.8**	-5.8**	-5.8**	-18**	-6.0**	-6.1**	-5.9**	-5.8**	-18**
r	-1.3	-1.2	-1.2	-1.2	-7.4**	-1.6	-1.7	-1.6	-1.5	-7.4**

Notes:

1. The ADF tests include constant and seasonal dummies, with or without a deterministic trend.
2. The lag lengths are chosen by using the Akaike Information Criterion.
3. The critical values used are – 4.012 and – 3.482 with or without trend at 1% critical values; -4.00 and -2.88 with and without trend at 5% critical value.
4. ** and * rejection of null hypothesis of a unit root at a significance level of 1%, and 5%.

Table I.2. Phillips-Perron unit root tests

Variables	With trend				Without trend			
	X		ΔX		X		ΔX	
m2-p	(7)	-2.30	(6)	-11.4**	(7)	-1.95	(6)	-11.3**
m2d-p	(6)	-2.03	(5)	-11.1**	(6)	-1.69	(6)	-11.0**
Y	(4)	-8.84**	(8)	-66.9**	(4)	-1.22	(4)	-55.8**
Δe	(3)	-14.2**	(55)	-104.3**	(3)	-14.2**	(55)	-103.8**
Δp	(5)	-7.7**	(14)	-28.8**	(5)	-7.7**	(14)	29.0**
r	(6)	-2.21	(3)	-7.88**	(6)	-2.37	(3)	-7.85**

Notes:

1. The Phillips-Perron tests include a constant, with or without a deterministic trend.
2. Test critical values (without trend): 1% level is -3.48; 5% level is -2.88, 10% level is -2.57.
3. Test critical values (trend): 1% level is -4.01; 5% level is -3.44, 10 % level is -3.14.

Second, we follow a standard cointegration method developed by Johansen (1995) to estimate a vector error-correction model (VECM) of the form:

$$\Delta X = \alpha\beta' X_{t-k} + \sum \Gamma_t \Delta X_{t-i} + D_t + \varepsilon_t \qquad (4)$$

where $X_t = [(m2d\text{-}p)_t, y_t, \Delta p_t, \Delta e_t, r_t]$, β' denotes the matrix of parameters of co-integrating vectors, $\beta' Y_{t-k}$ are long-run relationships, α is the matrix of equilibrium-correction, Γ_t is the matrix of short-run parameters, D_t denotes deterministic components (constants, seasonal dummy variables, and trends, and other dummies) and ε_t is the vector of error-term.

Monthly time series typically impose the inclusion of seasonal dummies into the VECM. Additionally, the Vietnam's economy is characterized by a high seasonality with boiling activities at the end and the beginning of years, with probable consequences on the money demand.

An important issue is to determine a relevant lag length in the underlying VAR that would allow well-behaved residuals. The results of unit root tests suggest that the lag length k=6 could fully capture the dynamics between the variables of the vector X. However, at such a lag length, the VECM residuals are miss-specified with high heterogeneity and

autocorrelation. Hendry and Juselius (2000) suggest that one solution to avoid miss-specification is to increase the lag length. Therefore, we re-estimate with k=9, which generates better results of the VECM residual statistics. Therefore, we accept an underlying VAR model with lag length k=9. Additionally, the ADF tests and Philips-Perron unit root tests reject the existence of a deterministic trend in cointegration spaces. Consequently, we test both specifications of an unrestricted intercept or without an unrestricted intercept, without a deterministic trend.

Initially, we investigate the model X = [m2d-p, y, Δe, Δp, r] with k=9 including a constant in the cointegrating space. While it does not much improve the overall specification, this model presents implausible preliminary results with poor economic sense (Appendix I.2). Therefore, we accept models without an intercept in the cointegration vector.

In the initial results, we find that the coefficient of the interest rate variable is statistically insignificant, that would signal heavy administrative controls that do not allow market determination and equilibrating fluctuations in an under-developed monetary market for the domestic currency in Vietnam. The result is consistent with previous empirical works. Bhattacharya (2014) on the period of 2001: Q1 to 2012: Q4, finds that interest rates have no relationship with M2 (but only with credit growth). Pham and Riedel (2012) 's results reveal that the authorities, on the conduct of monetary policy, are reliant on administrative controls, such as interest rates, targets on credit growth, quotas on lending by sectors, which distort the credit markets resulting in capital miss-allocation. Goujon (2006) also finds that the money demand is not affected by three-month dong deposit rates during the 1990s. Therefore, the interest rate variable is excluded from the vector X in the following.

We re-estimate an unrestricted VAR of the vector X = [m2d–p, y, Δe, Δp]. The result of the cointegration analysis is reported in table I.3. The residual tests reject miss-specification of the underlying VAR. However, large changes in the exchange rate in some periods are the cause of the non-normality of the residuals. The stability tests show that the VECM is stable over the studied period (Appendix I.1).

Table I.3. Cointegration analysis of the vector X = [m2d - p, y, Δe, Δp]

I.3.1. VECM residuals diagnostic statistics

	AR(1)	***AR(9)***	***JB***	***ARCH***	***H***
X	0.51 [0.94]	0.97 [0.57]	545.4 [0.00]		1.08 [0.22]
m2d – p	0.45 [0.50]	0.81 [0.60]	2.75 [0.25]	1.74 [0.08]	1.17 [0.23]
Y	1.64 [0.20]	0.93 [0.49]	23.7 [0.00]	1.18 [0.31]	0.95 [0.58]
Δe	0.25 [0.61]	0.64 [0.75]	502.4 [0.00]	0.24 [0.98]	0.80 [0.83]
Δp	0.00 [0.98]	1.81 [0.07]	17.73 [0.00]	0.73 [0.67]	1.63 [0.01]

I.3.2. Reduced rank statistic

Eigenvalues	***H0: rank ≤***	***Trace test***
	0	47.537 [0.05]*
0.121	1	24.781 [0.17]
0.067	2	11.825 [0.17]
0.050	3	2.494 [0.15]
0.014	4	

I.3.3. Adjustment coefficients and standardized eigenvectors (scaled on diagonal)

α	***α1***	***α2***	***α3***	***α4***
m2d-p	-0.05	-0.01	0.42	0.04
y	0.15	-0.32	0.26	0.07
Δe	-0.03	-0.18	-0.16	-0.03
Δp	0.01	0.01	0.07	-0.03

B	***β1***	***β2***	***β3***	***β4***
m2d-p	1	-0.66	-0.02	-0.08
Y	-1.45	1	0.02	0.09
Δe	15.1	10.6	1	1.09
Δp	10.3	-1.96	-1.32	1

I.3.4. Adjustment coefficients and restricted eigenvectors

I.3.4.1. Adjustment coefficients and restricted eigenvectors: α(m2d-p) =0;

LR test of restrictions: $\chi 2(1) = 4.72$ [0.03]*

A	***α1***
m2d – p	0
Y	0.19 [0.08]
Δe	-0.03 [0.01]
Δp	0.01 [0.01]

β	***β1***
m2d – p	1
y	-1.49 [0.04]
Δe	16.2 [6.78]
Δp	4.44 [4.54]

I.3.4.2. Adjustment coefficients and restricted eigenvectors: α(y) =0;.

LR test of restrictions: χ2(1) =2.00 [0.16]

A	***α1***
m2d – p	-0.03 [0.01]
Y	0
Δe	-0.02 [0.01]
Δp	0.01 [0.00]

β	***β1***
m2d – p	1
y	-1.41 [0.05]
Δe	30.7 [9.91]
Δp	14.5 [6.64]

I.3.4.3. Adjustment coefficients and restricted eigenvectors: α(Δe)=0.

LR test of restrictions: χ2(1) = 5.92 [0.01]*

A	***α1***
m2d – p	-0.06 [0.02]
Y	0.30 [0.11]
Δe	0
Δp	0.01 [0.01]

β	***β1***
m2d – p	1
y	-1.45 [0.03]
Δe	1.09 [4.96]
Δp	10.1 [3.32]

I.3.4.4. Adjustment coefficients and restricted eigenvectors: α(Δp)=0.

LR test of restrictions: χ2(1) = 4.23 [0.06]

A	***α1***
m2d – p	-0.04 [0.02]
Y	0.17 [0.08]
Δe	-0.03 [0.01]
Δp	0

β	***β1***
m2d – p	1
y	-1.45 [0.03]
Δe	12.2 [6.10]
Δp	13.1 [4.14]

I.3.4.5. Adjustment coefficients and restricted eigenvectors: α(y) =0 and α(Δp)=0.

LR test of restrictions: χ2(2) = 5.94 [0.08]

A	***α1***
m2d – p	-0.02 [0.01]
Y	0
Δe	-0.02 [0.01]
Δp	0

β	***β1***
m2d – p	1
y	-1.41 [0.06]
Δe	29.9 [12.1]
Δp	22.3 [8.12]

Notes:

1. AR(1) and AR(9) are LM tests for first-order and 1 to 9 order autocorrelation; JB is the Jaque-Bera test for normality; ARCH is LM test for conditional heteroskedasticity; H is the White test for heterosdasticity.
2. Marginal significance levels of the test statistics are presented in square brackets.
3. Standard errors of coefficients estimated are in parentheses.

The trace tests display the existence of one cointegrating vector. Considering statistical properties and the possible economic interpretation of a money demand function, we select the cointegration vector β1 and the error-correction vector α1 for the VECM.

We test weak exogeneity of the variables on the error-correction vector α1. The results presented in the tables I.3.4.1 – I.3.4.5 show that weak exogeneity is rejected for real M2D and the exchange rate depreciation but is not rejected for the real income and only marginally for the inflation rate. We then get two short-run equations for real M2D and the exchange rate depreciation responding to the error correction term.

The long-run money demand function is then:

$$m2d - p = 1.45y - 15.1\Delta e - 10.3\Delta p \qquad (5)$$

and an error-correction parameter α = -0.05 for the short-run money demand equation Δ(m2d – p) and α = -0.03 for the short-run equation of the exchange rate depreciation Δ(Δ(e)).

The long-run money demand function has several interesting characteristics. The real income elasticity is higher than unity signaling a monetization phenomenon in the economy. It means that a 1% increase in real income leads to a 1.45% increase in real M2D, which is consistent with previous findings (respectively 1.6 in Lai, 2013, and 2.5 in Diu and Pfau, 2014, using quarterly data).

The semi-elasticity of the inflation rate is -10.3. It indicates that one point of percentage rise in the expected inflation rate leads to a 10.3% decrease in money demand. Goujon (2006) examined the inflation rate in Vietnam and obtains the elasticity of the expected inflation rate with the money demand for domestic currency is 10.7 in the 1990s.[9]

[9] Lai (2013) calculates the variable of inflation rate based on method of Gerlach and Svensson (2003): $\pi^{e}_{t+4,t} = \pi^{obj}_{t+4} + \alpha_{\pi}(\pi_t - \pi^{obj}_t)$ where $\pi^{e}_{t+4,t}$ is the four-quarter expected inflation rate at *t+4* based on information on t, π_t is the four-quarter change in the consumer price index at *t,* α_{π} is measured as the weight put on the past deviation of inflation from its targeted rates. He finds that the coefficient of the inflation rate is -0.028 per quarter.

The elasticity of the expected depreciation of exchange rate is -15.1. It implies that 1 point of percentage increase in the nominal exchange rate or depreciation of Vietnam dong leads to -15.1 % decrease in money demand. Goujon (2006) finds the coefficient of the exchange rate is -4.72. Lai (2013) finds the coefficient of the exchange rate is – 6.013 per quarter [10]. Regarding the Lai (2003)'s result, our result is lower and reasonable compared to the definition and the calculation of the variable. The negative coefficient for the exchange rate depreciation implies that economic agents convert domestic currency to foreign currency when the nominal exchange rate depreciates.

The results indicate that real money demand is highly sensitive to the expected inflation rate and depreciation of the exchange rate. Together with the exclusion of the interest rates as a determinant of the demand for money, this signals that real assets are more attractive than financial assets when hedging against inflation. Particularly, the prices of real assets usually increase more than the rate of return of financial assets. Moreover, the stock market is immature and thin, and economic agents run to the land and housing markets and/or the gold market to buy stores of value and speculative assets.

The error-correction speed toward equilibrium of real money demand is 5% per month. It indicates that agents and individuals will correct their excessive money holdings with a speed of 5% per month. The result is consistent with Goujon (2006) who finds the error-correction speed is 3% per month but significantly lower than Lai (2013) and Diu and Pfau (2014) that find an estimate of the speed of error-correction of 34% and 57% per quarter, respectively.

Additionally, the results of weakly exogenous tests show that the inflation rate is not significantly affected by excess money only. It would, however, been affected by short-run monetary shocks and also by wages, the world prices, but it would also be inertial. Contrastingly, the exchange rate seems to be endogenous, it adjusts from fluctuation toward the equilibrium levels with the error-correction speed of 3% per month.

The result of the estimation of the money demand function for M2 exhibits a weak link to the opportunity cost of holding money because it includes the foreign currency deposit

[10] Lai (2003) calculated the variable of exchange rate based on the logarithm of nominal exchange rate VND/USD.

in the banking system that is considered as hedging assets. When costs of holding money of domestic currency increase the agents and individuals may convert to foreign currency against the devaluation of domestic currency. Therefore, the monetary stock M2 does not precisely reflect the changes in the amount of domestic currency.

CONCLUSION

In this paper, we investigate a demand function of money in Vietnam with monthly data from 2001:M1 to 2016:M12 applying a standard cointegration approach. The result displays that the real money demand of the domestic currency is cointegrated with the real income, the expected inflation rate, and the expected exchange rate depreciation. Moreover, interest rates are not an opportunity cost of holding money in the long term. It indicates that the money market is still underdeveloped in which the interest rates are still under administrative controls. The interest rate seems to be still an ineffective channel for the transmission of monetary policy. In addition, the result shows that the excess of money does not cause inflation in the long term. The money expansion only impacts inflation in the short term. Inflation would then be driven by other factors such as wages, the world's prices, and rigidity. However, the exchange rate is endogenous in the long term, responding to excess money.

The monetary aggregate M2 displays a weak link to the opportunity cost of holding money because it includes the foreign currency deposit in the banking system that is considered as hedging assets.

The monetary stock M2D is more stable and displays a significant relation to the opportunity cost of holding money. The changes in the variables of the opportunity cost of holding money may be accurately reflected in the monetary aggregate M2D. Consequently, it suggests that the Vietnamese authorities should regard the monetary aggregate M2D as an intermediate target to conduct the monetary policy.

References

Adam, C., Goujon, M., & Jeanneney, S. G. (2004). The transactions demand for money in the presence of currency substitution: evidence from Vietnam. *Applied Economics*, *36*(13), 1461-1470.

Akinlo, A. E. (2006). The stability of money demand in Nigeria: an autoregressive distributed lag approach. *Journal of Policy Modeling*, *28*(4), 445-452.

Baharumshah, A. Z., Mohd, S. H., & Masih, A. M. M. (2009). The stability of money demand in China: Evidence from the ARDL model. *Economic systems*, *33*(3), 231-244.

Bahmani-Oskooee, M., & Economidou, C. (2005). How stable is the demand for money in Greece?. *International Economic Journal*, *19*(3), 461-472.

Bahmani-Oskooee*, M., & Rehman, H. (2005). Stability of the money demand function in Asian developing countries. *Applied Economics*, *37*(7), 773-792.

Bhattacharya, R. (2014). Inflation dynamics and monetary policy transmission in Vietnam and emerging Asia. *Journal of Asian Economics*, *34*, 16-26.

Camen, U. (2006). Monetary policy in Vietnam: the case of a transition country. *Press & Communications CH 4002 Basel, Switzerland*, *232*.

Choudhry, T. (1995). Long-run money demand function in Argentina during 1935–1962: evidence from cointegration and error correction models. *Applied Economics*, *27*(8), 661-667.

Cziráky, D., & Gillman, M. (2006). Money demand in an EU accession country: a VECM study of Croatia. *Bulletin of Economic Research*, *58*(2), 105-127.

Dagher, J., & Kovanen, A. (2011). On the stability of money demand in Ghana: A bounds testing approach.

Dahalan, J., Sharma, S. C., & Sylwester, K. (2007). Scale variable specification in a money demand function for Malaysia. *Journal of Asian Economics*, *18*(6), 867-882.

Dickey, D. A., & Fuller, W. A. (1981). Likelihood ratio statistics for autoregressive time series with a unit root. *Econometrica: Journal of the Econometric Society*, 1057-1072.

Diu, N. H., & Pfau, W. D. (2010). The Determinants and Stability of Real Money Demand in Vietnam, 1999-2009. *GRIPS Policy Research Center, discussion paper*, 10-14.

Elgammal, M. M., & Eissa, M. A. (2016). Key determinants of inflation and monetary policy in the emerging markets: evidence from Vietnam. *Afro-Asian Journal of Finance and Accounting*, *6*(3), 210-223.

Goujon, M. (2006). Fighting inflation in a dollarized economy: The case of Vietnam. *Journal of comparative economics*, *34*(3), 564-581.

Hendry, D. F., & Juselius, K. (2001). Explaining cointegration analysis: Part II. *The Energy Journal*, 75-120.

Hossain, A. A. (2010). Monetary targeting for price stability in Bangladesh: How stable is its money demand function and the linkage between money supply growth and inflation?. *Journal of Asian Economics*, *21*(6), 564-578.

IMF, V. (2006). Article IV Consultation. *IMF country report*, *6*, 421.

IMF *country report*, several years, from 1998 to 2016.

Inoue, T., & Hamori, S. (2008). An empirical analysis of the money demand function in India. *Institute of Developing Economies*, Discussion Paper, 166.

James, G. A. (2005). Money demand and financial liberalization in Indonesia. *Journal of Asian Economics*, *16*(5), 817-829.

Johansen, S. (1995). Likelihood-based inference in cointegrated vector autoregressive models. *Oxford University Press on Demand*.

Kumar, S. (2011). Financial reforms and money demand: Evidence from 20 developing countries. *Economic Systems*, *35*(3), 323-334.

Lai, Ngoc-Anh, Is Money Demand in Vietnam Stable? Application of the Bounds Testing Approach (February 25, 2013). *25th Australasian Finance and Banking Conference 2012*. Available at: SRN: https://ssrn.com/abstract=2101111 or http://dx.doi.org/10.2139/ssrn.2101111

Lee, C. C., & Chien, M. S. (2008). Stability of money demand function revisited in China. *Applied economics*, *40*(24), 3185-3197.

Le, V. T., & Nguyen, T. T. V. (2011). The impact of oil prices, real effective exchange rate and inflation on economic activity: Novel evidence for Vietnam. *RIEB Kobe University*, Discussion Paper Series, DP2011-09.

Nguyen, H. M., Cavoli, T., & Wilson, J. K. (2012). The determinants of inflation in Vietnam, 2001–09. *ASEAN Economic Bulletin*, *29*(1), 1-14.

Nwaobi, G. (2002). A vector error correction and non-nested modeling of money demand function in Nigeria. *Economics Bulletin*, *3*(4), 1-8.

Oomes, N., & Ohnsorge, F. (2005). Money demand and inflation in dollarized economies: The case of Russia. *Journal of Comparative Economics*, *33*(3), 462-483.

Obben, J. (1998). The demand for money in Brunei. *Asian Economic Journal*, *12*(2), 109-121.

Pham, T. T. T., & Riedel, J. (2012). On the conduct of monetary policy in Vietnam. *Asian-Pacific Economic Literature*, *26*(1), 34-45.

Pradhan, B. K., & Subramanian, A. (2003). On the stability of demand for money in a developing economy: some empirical issues. *Journal of Development Economics*, *72*(1), 335-351.

Sriram, S. S. (2000). A survey of recent empirical money demand studies. *IMF Staff papers*, *47*(3), 334-365.

Sriram, S. S. (2002). Determinants and stability of demand for M2 in Malaysia. *Journal of Asian Economics*, *13*(3), 337-356.

Vo, V. M. (2009). Exchange Rate Pass-Through and Its Implications for Inflation in Vietnam (Vol. 902). *Working Paper*.

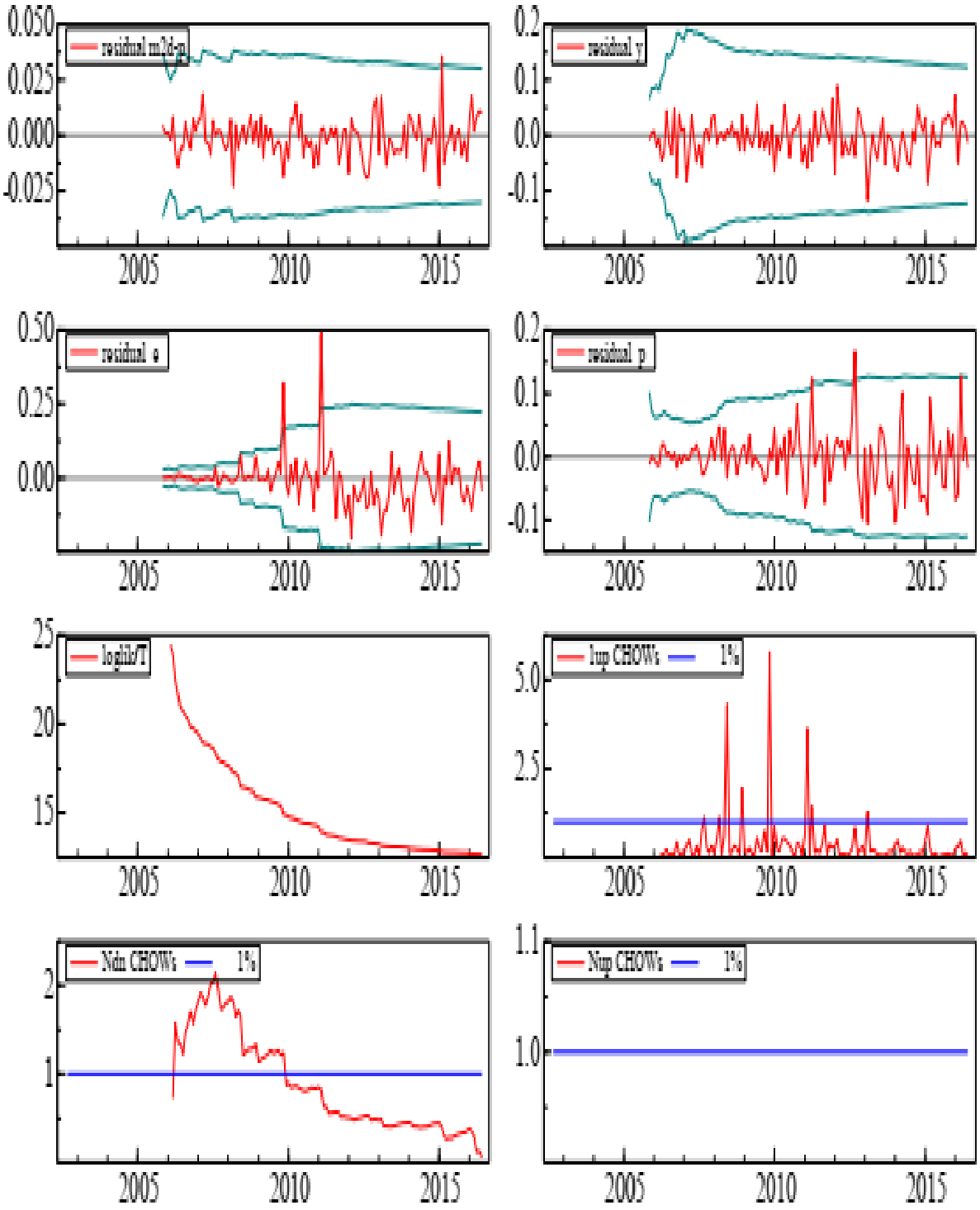
Végh, C. (1992). Currency substitution in developing countries: an introduction.

Vinh, N. T. T. (2011). The impact of oil prices, real effective exchange rate and inflation on economic activity: Novel evidence for Vietnam *(No. DP2011-09)*.

Wu, G. (2009). Broad money demand and asset substitution in Chin*a* (No. 9-131). *International Monetary Fund*.

Zannah, M., Ramly, A., & Mahat, F. (2017). Determinant of money demand in India. *Qualitative and Quantitative Research Review*, 2(2).

Appendix I.1: Stability test of VECM [X=(m2d-p, y, Δe, Δp)]



Note. The graphs depict the one-step residuals, the one-step Chow test (1-up), the break-point Chow test (N-down).

Appendix I.2: Cointegration analysis of the vector X=[m2d-p, y, Δe, Δp, r]

1. VECM residuals diagnostic statistics

	AR(1)	***AR(9)***	***JB***	***ARCH***	***H***
Y	0.58 [0.95]	0.98 [0.53]	324.8 [0.00]		1.42 [0.00]
m2d – p	0.79 [0.37]	0.77 [0.59]	6.53 [0.04]	9.39 [0.00]	1.08 [0.36]
y	0.01 [0.90]	0.60 [0.72]	24.8 [0.00]	0.47 [0.49]	0.84 [0.78]
Δe	2.05 [0.15]	0.82 [0.55]	181.1 [0.00]	0.09 [0.75]	1.32 [0.10]
Δp	2.07 [0.15]	0.63 [0.70]	9.88 [0.01]	1.63 [0.20]	1.49 [0.03]
r	0.44 [0.50]	0.39 [0.88]	109.5 [0.00]	0.26 [0.60]	3.51 [0.00]

2. Reduced rank statistic

Eigenvalues	***H0: rank ≤***	***Trace test***
	0	
0.250	1	114.11 [0.000]**
0.163	2	63.312 [0.005]**
0.108	3	31.865 [0.109]
0.045	4	11.744 [0.480]
0.020	5	3.577 [0.490]

3. Adjustment coefficients and standardized eigenvectors (scale on diagonal)

α	***α1***	***α2***	***α3***	***α4***
m2d-p	-0.01	0.08	0.02	-0.34
y	-0.03	0.02	-3.66	0.02
Δe	0.02	0.01	0.01	0.19
Δp	0.01	-0.02	-0.03	-0.17
r	-0.08	-0.13	0.27	-0.25

β	***β1***	***β2***	***β3***	***β4***
m2d-p	1	-0.70	-0.14	0.01
y	-1.45	1	0.21	-0.01
Δe	-45.3	-8.85	1	-0.74
Δp	-33.8	-7.48	0.10	1
r	1.03	-0.04	-0.03	-0.01
constant	16.1	-10.9	-2.57	0.11

4. Adjustment coefficient and eigenvector of money demand

α	***α1***
m2d – p	-0.01 [0.01]
y	-0.03 [0.04]
Δe	0.02 [0.04]
Δp	0.01 [0.01]
r	-0.08 [0.03]

β	***β1***
m2d – p	1
y	-1.45 [0.04]
Δe	-45.3 [8.90]
Δp	-33.8 [8.28]
r	1.03 [0.17]
constant	16.1 [1.47]

Notes:

1. AR(1) and AR(6) are LM tests for first-order and 1 to 6 order autocorrelation; JB is the Jaque-Bera test for normality; ARCH is LM test for conditional heteroskedasticity; H is the White test for heterosdasticity.
2. Marginal significance levels of the test statistics are presented in square brackets.
3. Standard errors of coefficients estimated are in parentheses.

Appendix I.3: Cointegration analysis of the vector X=[m2d-p, y, Δe, Δp]

1. VECM residuals diagnostic statistics

	AR(1)	***AR(9)***	***JB***	***ARCH***	***H***
Y	0.51 [0.94]	0.98 [0.57]	545.4 [0.00]		1.08 [0.22]
m2d – p	0.45 [0.50]	0.81 [0.60]	2.75 [0.25]	8.52 [0.00]	1.17 [0.23]
y	1.64 [0.20]	0.93 [0.49]	23.7 [0.00]	0.11 [0.73]	0.95 [0.58]
Δe	0.25 [0.61]	0.64 [0.75]	502.4 [0.00]	0.07 [0.78]	0.80 [0.83]
Δp	0.00 [0.99]	1.81 [0.07]	17.7 [0.00]	0.71 [0.40]	1.63 [0.01]

2. Reduced rank statistic

Eigenvalues	***H0: rank ≤***	***Trace test***
	0	
0.181	1	73.691 [0.000]**
0.112	2	38.530 [0.019]*
0.057	3	17.476 [0.116]
0.039	4	7.131 [0.123]

3. Adjustment coefficients and standardized eigenvectors (scale on diagonal)

α	***α1***	***α2***	***α3***	***α4***
m2d-p	-0.01	0.02	0.56	-0.09
y	-0.02	-0.44	-1.68	-0.58
Δe	-0.00	0.05	-0.47	-0.09
Δp	0.00	-0.01	0.03	-0.13

β	***β1***	***β2***	***β3***	***β4***
m2d-p	1	-0.67	-0.03	-0.03
y	-1.11	1	0.05	0.04
Δe	65.1	-6.22	1	0.35
Δp	33.4	-5.33	-0.59	1
constant	4.56	-11.8	-0.58	-0.60

4. Adjustment coefficient and eigenvector of money demand

α	***α1***
m2d – p	-0.01 [0.00]
y	-0.03 [0.01]
Δe	0.001 [0.001]
Δp	0.003 [0.001]

β	***β1***
m2d – p	1
y	-1.11 [0.18]
Δe	65.1 [34.2]
Δp	33.4 [22.9]
constant	4.56 [5.92]

Notes:

1. AR(1) and AR(6) are LM tests for first-order and 1 to 6 order autocorrelation; JB is the Jaque-Bera test for normality; ARCH is LM test for conditional heteroskedasticity; H is the White test for heterosdasticity.
2. Marginal significance levels of the test statistics are presented in square brackets.
3. Standard errors of coefficients estimated are in parentheses.

Appendix I.4: Cointegration analysis of the vector X=[m2 – p, y, Δp, Δe, r]

1. VECM residuals diagnostic statistics

	AR(1)	***AR(6)***	***JB***	***ARCH***	***H***
Y	0.86 [0.65]	0.98 [0.53]	272.6 [0.00]		1.44 [0.00]
m2 – p	1.48 [0.22]	0.31 [0.93]	0.61 [0.73]	4.53 [0.03]	1.23 [0.16]
y	0.07 [0.78]	0.51 [0.79]	25.9 [0.00]	1.07 [0.30]	0.87 [0.74]
Δe	2.23 [0.13]	0.77 [0.59]	167.2 [0.00]	0.08 [0.77]	1.41 [0.06]
Δp	2.09 [0.15]	0.75 [0.61]	10.6 [0.01]	1.09 [0.29]	1.33 [0.09]
r	0.47 [0.49]	0.23 [0.96]	86.9 [0.00]	0.13 [0.71]	3.42 [0.00]

2. Reduced rank statistic

Eigenvalues	***H0: rank ≤***	***Trace test***
	0	123.06 [0.000]**
0.269	1	67.842 [0.001]**
0.160	2	37.025 [0.030]*
0.132	3	12.106 [0.448]
0.048	4	3.2991 [0.537]
0.018	5	

3. Adjustment coefficients and standardized eigenvectors (scale on diagonal)

α	***α1***	***α2***	***α3***	***α4***
m2-p	-0.01	0.01	0.24	-0.18
y	-0.03	0.03	-3.84	0.04
Δe	0.02	0.00	0.04	0.24
Δp	0.01	-0.01	-0.10	-0.18
r	-0.08	-0.04	-0.08	-0.06

β	***β1***	***β2***	***β3***	***β4***
m2-p	1	-0.84	-0.16	0.01
y	-1.28	1	0.21	-0.02
Δe	-46.1	-39.2	1	-0.76
Δp	-31.9	-19.9	-0.41	1
r	1.02	0.07	-0.02	-0.00
Const	10.7	-6.24	-2.01	0.13

4. Adjustment coefficient and eigenvector of money demand

α	***α1***
m2 – p	-0.01 [0.00]
y	-0.03 [0.04]
Δe	0.02 [0.01]
Δp	0.01 [0.00]
r	-0.08 [0.03]

β	***β1***
m2 – p	1
y	-1.28 [0.04]
Δe	-46.1 [8.50]
Δp	-31.9 [7.74]
r	1.02 [0.16]
const	10.7 [1.36]

Note:

1. AR(1) and AR(6) are LM tests for first-order and 1 to 6 order autocorrelation; JB is the Jaque-Bera test for normality; ARCH is LM test for conditional heteroskedasticity; H is the White test for heterosdasticity.
2. Marginal significance levels of the test statistics are presented in square brackets.
3. Standard errors of coefficients estimated are in parentheses.

Appendix I.5: Cointegration analysis of the vector X=[m2 – p, y, Δp, Δe]

1. VECM residuals diagnostic statistics

	AR(1)	***AR(6)***	***JB***	***ARCH***	***H***
Y	0.91 [0.55]	0.90 [0.75]	557.6 [0.00]		1.12 [0.13]
m2 – p	2.03 [0.15]	1.45 [0.17]	0.04 [0.97]	4.51 [0.04]	1.55 [0.02]
y	1.92 [0.16]	0.82 [0.59]	23.8 [0.00]	0.36 [0.54]	0.99 [0.51]
Δe	0.89 [0.34]	0.68 [0.72]	532.4 [0.00]	0.07 [0.78]	0.79 [0.84]
Δp	0.45 [0.50]	1.24 [0.27]	17.2 [0.00]	0.56 [0.45]	1.41 [0.05]

2. Reduced rank statistic

Eigenvalues	***H0: rank ≤***	***Trace test***
	0	76.569 [0.000]**
0.182	1	41.162 [0.009]**
0.115	2	19.482 [0.063]
0.065	3	7.356 [0.111]
0.040	4	

3. Adjustment coefficients and standardized eigenvectors (scale on diagonal)

α	***α1***	***α2***	***α3***	***α4***
m2-p	0.02	0.05	0.44	-0.16
y	0.11	-0.29	-2.21	-0.35
Δe	-0.00	0.04	-0.56	-0.08
Δp	-0.01	-0.02	-0.05	-0.15

β	***β1***	***β2***	***β3***	***β4***
m2-p	1	-0.76	-0.04	-0.01
y	-1.40	1	0.05	0.01
Δe	-19.7	-7.42	1	0.07
Δp	2.84	-5.90	-0.48	1
Const	15.5	-9.14	-0.49	-0.12

4. Adjustment coefficient and eigenvector of money demand

α	***α1***
m2 – p	0.02 [0.01]

β	***β1***
m2 – p	1

y	0.11 [0.03]
Δe	-0.001 [0.004]
Δp	-0.008 [0.002]

y	-1.40 [0.06]
Δe	-19.7 [11.4]
Δp	2.84 [7.58]
const	15.5 [1.93]

Note:

1. AR(1) and AR(6) are LM tests for first-order and 1 to 6 order autocorrelation; JB is the Jaque-Bera test for normality; ARCH is LM test for conditional heteroskedasticity; H is the White test for heterosdasticity.
2. Marginal significance levels of the test statistics are presented in square brackets.
3. Standard errors of coefficients estimated are in parentheses.

CHAPTER II.

THE RELATIONSHIP BETWEEN THE BLACK AND OFFICIAL EXCHANGE RATES

INTRODUCTION

Exchange rate management remains a key challenge in economic development strategies for developing countries' integration in the globalization process (Eichengreen, 2007). Avoiding local currency overvaluation, if not applying undervaluation, remains an imperative, particularly for open economies where competitiveness, growth, and inflation are greatly affected by the changes in the exchange rate. Overvaluation would hamper, while undervaluation would accelerate growth (Gala, 2008), with likely non-linear effects (Couharde and Sallenave, 2013). Rodrik (1986, 2008) explains that undervaluation is a positive factor of industrialization by compensating institutional and market failures. Therefore, identifying the appropriate level of exchange rate remains until now a challenging task for countries pursuing a managed or pegged exchange rate policy.

In countries where the pegged official exchange rate is overvalued and the balance of payments deficit is persistent despite various administrative controls, the international reserves can be too low to fulfill the demand for foreign currencies at the official market's conditions. Consequently, an illegal market (a black market) for foreign exchange can develop and play an important role, even for the official exchange rate policy (Edward, 1989; Agenor, 1992; Montiel, Agenor and Ui Haque, 1993; Agenor and Taylor, 1993; Kiguel and O'Connel, 1995; Phylaktis, 1997; Panayiotis and Anastassios, 2005).

Since the early 1990s, Vietnam has implemented several changes in its exchange rate arrangement. However, the exchange rate has usually been pegged to the United States dollar (USD) in periods of macroeconomic stability, while it has been depreciated with

more adjustment in periods of instability (Vo et al, 2000; Phuc and Duc-Tho, 2009; Nguyen et al, 2010)[11].

Foreign exchange transactions in Vietnam coexist in an official market and black markets. The official market can be roughly presented as a two-level market. The first level is a market where foreign exchange transactions are carried out between commercial banks or credit institutions and their final customers, being firms or individuals. The second level is an interbank market in which foreign currencies are sold and purchased between authorized commercial banks and credit institutions, and where the central bank, the State Bank of Vietnam (SBV), intervene to determine the level of the official exchange rate (OER).

The *de jure* rules that the authorities implement to determine the level of the OER are known. Since 1999, the OER of the day equals the interbank exchange rate (IER) of the previous day (that is calculated as an average of purchasing exchange rates applied by authorized commercial banks and credit institutions). The IER of the day can fluctuate around the OER within an authorized margin of fluctuations set by the SBV. The IER and the OER are then determined by the supply and the demand for foreign exchange in the interbank market, which would be determined by the supply of and the demand for foreign currency emanating from the Vietnamese economy. However, the supply and demand for foreign exchange can be strongly influenced by the SBV in the interbank market.

Outside-banks foreign exchange transactions between domestic firms and/or individuals are legally prohibited but are rather tolerated, if not ignored, by authorities, leaving room for the development of black markets. However, Vietnamese authorities have remained silent about the importance and the role of the black markets, while there is evidence showing that black market transactions are not anecdotal.

The question we focus on is whether the black market plays a role in the official exchange rate policy; or whether the black market represents only a residual market that is

[11] According to the categories of the International Monetary Fund's exchange rate regimes, Vietnam followed multiple exchange rates (before 1989); crawling bands (1989-1990); pegged exchange rate within horizontal bands (1991-1993); conventional fixed peg arrangement (1994-1996); crawling bands (1997-1998); conventional fixed peg arrangement (1999-2000); crawling peg (2001-2007); crawling bands (2008-2011); conventional fixed peg arrangement (2012-2015).

influenced by the events occurring in the official market. The mutual influence that both markets may have each other depend on very specific conditions, such as the relative size of both markets, the porosity between them, and whether actors on one market observe and utilize the information on the supply-demand disequilibria that are reflected in the change in the exchange rate in the other market. This question is relative to discussion about market efficiency or informational efficiency.

In an attempt to respond to these questions, we investigate the relationship between the black and official exchange rates in Vietnam over the 2000-2015 period with monthly data. We apply a cointegration analysis developed by Johansen (1995) and a vector error correction model (VECM) specification that allows us to test the exogeneity of exchange rates.

The rest of the paper is organized as follows. Section II.1 presents the context of Vietnam, with a brief review of foreign exchange markets and policy. Section II.2 presents the theoretical elements that underpin the relationship between the official and the black exchange rates. Section II.3 is a brief review of empirical works and section II.4 introduces the methodology and data. Section II.5 presents our empirical results and conclusion section.

II.1. A BRIEF OVERVIEW OF FOREIGN EXCHANGE MARKETS AND EXCHANGE RATE POLICY IN VIETNAM

II.1.1. Exchange rate policy

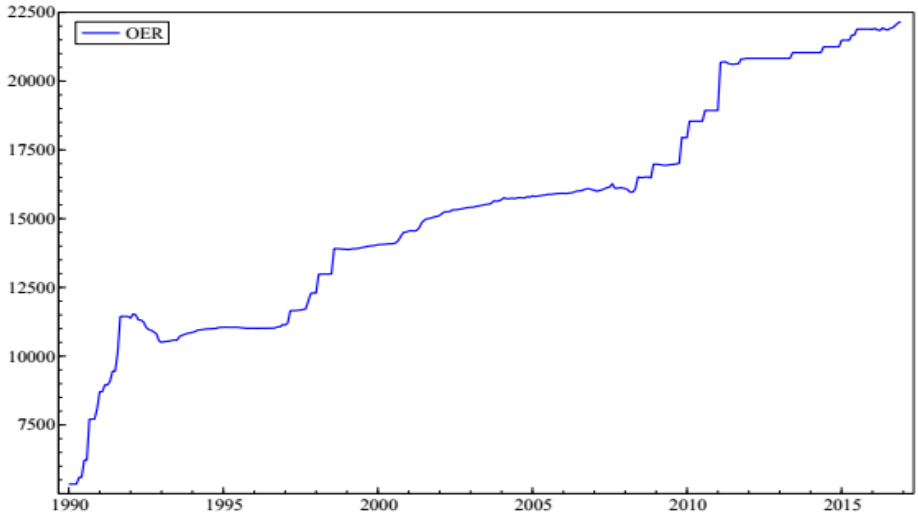
In the move from a central planning to a market-oriented economy, Vietnam unified foreign exchange markets and exchange rates in the early 1990s and since then has experienced various changes in its exchange rate regime. In the period 1989-1991, the exchange rate was considered as floating when a large depreciation associated with hyperinflation occurred. In 1991, after the application of a large but brief and surprising appreciation, the SBV adopted a fixed exchange rate regime to curb inflation and to maintain economic stability. The SBV also replaced two foreign exchange transaction

floors[12] by an interbank foreign exchange market in 1994 where the SBV plays the role of final buyer and seller of foreign currencies. The SBV set the official exchange rate and transactions were permitted at a rate within a band of 0.5-1% around the official rate. Then, the official exchange rate remained stable at 10,000-11,000 Vietnam dong (VND) per USD and only depreciated significantly in periods of macroeconomic disturbances. During the Asian financial crisis in 1997-1999, the official rate depreciated by 10.2% in 1997 and 5.6% in 1998, to around 14,000 VND/USD. At the same time, trading bands were adjusted to 5% then 10% in 1997 and reduced to 7% in 1998. In 1999, the SBV introduced a new method to set the exchange rate where the OER of the day equals the average IER of the previous day. Commercial banks are authorized to trade currencies at a rate within a narrow band of only 0.1% around the OER. While the trading band was enlarged to 0.5%, the OER depreciated only gradually in the period 2001-2007, to around 16,000 VND/USD. In contrast, the period of 2008-2011 witnessed large fluctuations in the exchange rate following the impact of the global financial crisis and macroeconomic instability. The OER depreciated several times in this period, from 16,100 VND/USD in 2007 to 20,800 VND/USD in 2011, losing its value by approximately 29%. Besides, the trading band was first widened several times (from ±0.75% in December 2007; to ±1% in March 2008; to ±2% in April 2008; ±3% in November 2008; ±5% in March 2009) and then narrowed at ±3% in November 2009; and to ±1% in February 2011). The OER stabilized to attain 21.890 VND/USD in late 2015 while the trading band was maintained at ±1%. In response to the concern of exchange rate overvaluation, particularly against the Chinese Yuan (IMF, 2009, 2010; Phuc and Duc-Tho, 2009; Nguyen et al, 2010; Bui et al, 2017), the SBV introduced a new method of setting the exchange rate in January 2016. *De jure*, the OER of the day is currently determined on the basis of three core elements: (1) the average IER of the previous day; (2) changes in the international markets of the currencies' exchange rates of some partner countries; (3) macroeconomic equilibrium, exchange rate, and monetary policy objectives. Although it results in an unclear method of setting the OER, it implies that the anchor of the VND against the USD is replaced by a new anchor based on a basket of currencies. Moreover, the new exchange

[12] In 1991, the SBV opened the two trading floors for foreign exchange in Hanoi and Ho Chi Minh. The OER was determined daily basing on the closing rates of the two floors of the previous day. The commercial banks were permit to set the exchange rate within a trading band of ± 0.5% around the OER, IMF (1996).

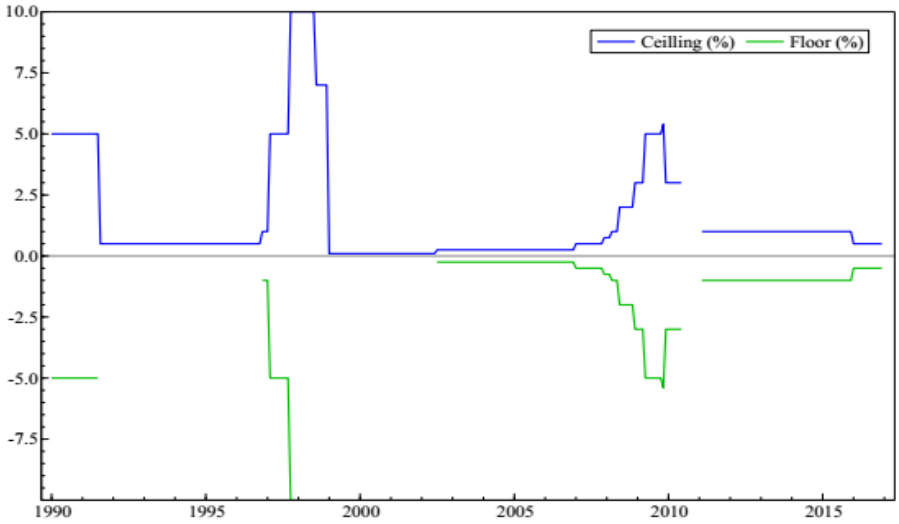
rate regime is considered as a managed floating exchange rate regime, where the OER fluctuates smoothly.

Figure II.1: Nominal exchange rate (VND/USD)



Source: International Financial Statistics (IMF)

Figure II.2. The trading bands



Source: The State Bank of Vietnam.

II.1.2. Foreign exchange controls and segmented foreign exchange markets

The black or parallel foreign exchange market in developing countries is typically viewed as resulting from government restrictions on access to the official market, which are set in order to preserve international reserves and to administratively stabilize the official exchange rate. Since the 1990s, Vietnam's authorities have imposed many restrictions on current account and financial transactions.

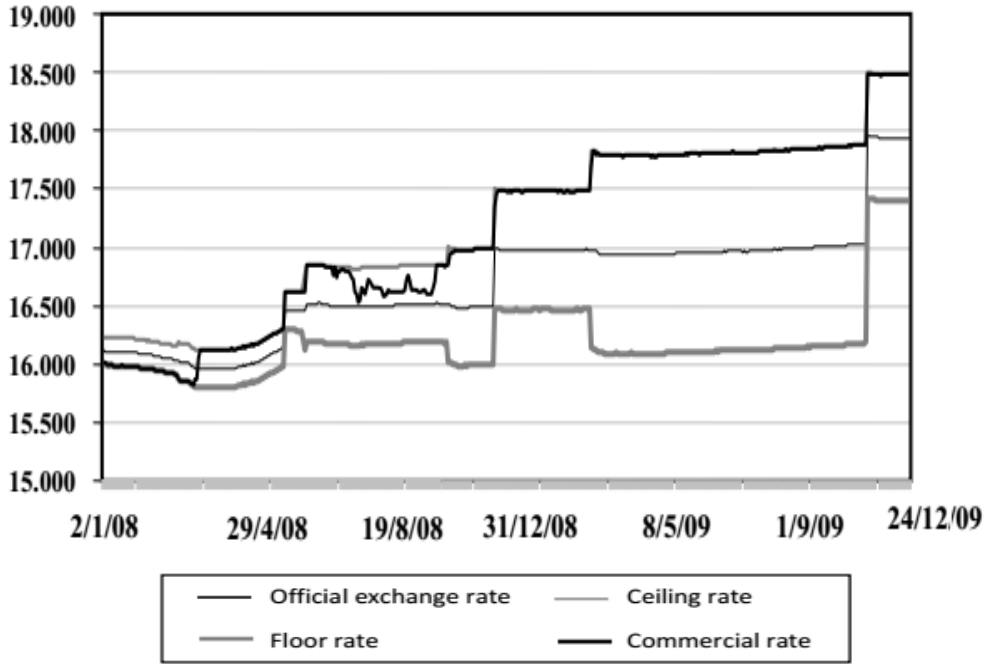
In 1998, during the Asian financial crisis, strict control over foreign exchange surrender requirements was imposed, up to 80% of export revenue. The ratio was gradually reduced to 50% and then 40% in 2001. It was again lowered to 30% in 2002 and completely removed from April 2003 following Vietnam's agreement with the IMF and the World Bank. In 2005, Vietnamese authorities issued a new ordinance on foreign exchange management asserting a liberalization of current account transactions and the abolishment of any requirement of foreign exchange surrender. However, *de facto*, foreign exchange repatriation remains an obligation. According to this regulation, residents that obtain foreign currencies from export or remittances must deposit these earnings into a foreign currency deposit opened in authorized credit institutions in Vietnam. Export revenues can be used for imports and payments in foreign currency but partial repatriation is prohibited.

Other controls take the form of foreign exchange rationing that is implemented since the 1990s, with the aim of imposing restrictions on imports that can be a cause of a shortage of foreign exchange. Priority is next placed to imports of capital equipment and materials for domestic production, while imports of consumption and luxury goods are repressed. Priority is also granted to intermediate materials such as petroleum products, fertilizer, iron, and steel imported by State-owned enterprises (SOEs). Favored access of SOEs to foreign currencies from the commercial banking system has been maintained until recent years (Vo et al, 2000; Nguyen et al, 2010).

In response to these controls on the official exchange rate setting, and to various restrictions on official foreign exchange access, Vietnam has seen the development of a parallel foreign exchange market. Controls artificially reduce foreign currency demand, causing overvaluation of the OER during some episodes over 1990-2008 (IMF, 2009). Phuc and Duc-Tho (2009) find that the real effective exchange rate appreciated by more than 15% in 1992-2007, and Nguyen et al (2010) that it appreciated by 12% in 2000-

2009. Another sign of foreign exchange control, excess demand for foreign exchange and overvaluation, is that the exchange rates of commercial banks were usually close to the ceiling bands imposed by the SBV, in particular in 2008-2009.

Figure II.3: The exchange rate VND/USD and trading bands, 2008-2009.



Note: the commercial exchange rate is the Vietcombank selling exchange rate (the biggest banking forex in Vietnam). *Source:* Nguyen et al. 2010.

The unofficial (black) foreign exchange market is illegal but is tolerated by Vietnam's authorities. Moreover, foreign exchange agents and private exchange offices are recognized by the regulations of the SBV. Therefore, instead of calling this unofficial market as "black", authorities often refer to the "parallel" or "free" market. Besides direct transactions between economic agents, participants in the black market consist of thousands of private foreign exchange offices and jewelry shops, around the country but mostly in the largest cities.

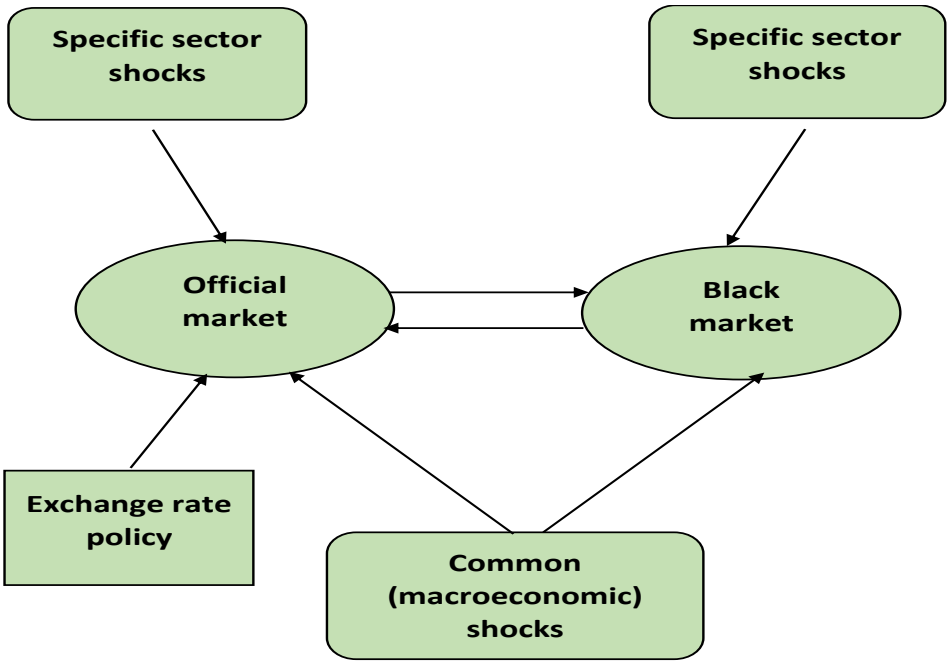
The SBV ignores the importance of the black market and has not published any estimation of the black market size. However, Nguyen (2006) estimated that the black market accounts for 20% of the total foreign exchange transaction volume in the 1990s. More recently, Nguyen et al (2010) indicated that the size of the black market is quite large in

the total foreign exchange market and that the black market still grows given the continuing foreign exchange controls imposed by the government.

The historical *de facto* partial dollarization, the use of the dollar for transactions in durable goods and services and in savings, represent another characteristic of Vietnam's economy that offers room to a black market for foreign exchange.

II.2. THE EXPECTED RELATIONSHIP BETWEEN THE OFFICIAL AND THE BLACK EXCHANGE RATES

Both official and black markets can be affected by common factors and by specific factors, being economic and policy factors. For instance, exchange arrangements and restrictions may have direct or indirect effects on both markets. Moreover, both markets may mutually influence each other, in the case of porosity between the two markets; i.e. they are not fully segmented. This would justify the presence of a long-run relationship between the OER and the BER, while both rates might diverge in the short-run if common factors do not have the similar impact on both, or if they are affected by specific short-run shocks. Moreover, frictions or transaction costs, or different risks, may allow short-run gaps between both rates. These elements can be summarized in the following figure.



Both markets are connected when the same economic agents can transact on them or when participants in one market can transact with participants from the other market. Then, shifts of supply and demand between both markets may ensure that both rates would not diverge considerably and durably. The influence of one market on the other obviously depends on their relative size. The higher the relative size of one market, the more likely is that any excess demand or supply in this market (implying changes in the exchange rate in this market) generate an excess demand or supply in the other market, implying similar changes in the other exchange rate. As explained above, even if significant, the black market in Vietnam seems to be smaller than the official market, suggesting that the OER is more likely to influence the BER than inversely.

However, whether the OER and/or the BER adjust to ensuring a long-term relationship between both rates depends on the specific functioning of the two markets, on *de jure* or *de facto* rules, and on the comportment of agents operating in these markets.

In Vietnam, the OER is determined in the official or interbank foreign exchange market, where only authorized commercial banks, credit institutions and the SBV operate. The IER is the average exchange rate applied in transactions between authorized commercial banks and credit institutions in the interbank market. Forcefully, since 1999 the OER is determined following this rule:

OER of the day = IER of the previous day.

IER of the day = OER of the day ± authorized margin of fluctuations.

The margin of fluctuations is set by the SBV and has been changed over time (figure 2).

The IER is primarily determined by the supply and the demand for foreign currencies from the commercial banks, for their own operations but they would mostly relay the supply and demand from the real sector of the economy. Except if leakages from the banking system are extremely important, there then should have a link between the balance of payments disequilibrium and changes in the IER and the OER. However, a particularity of Vietnam is that the needs for foreign exchange transactions are amplified by the *de facto* partial dollarization of the domestic economy, where the USD can be used in transactions in goods between domestic firms and/or individuals and savings. Then, if the official foreign exchange market does not satisfy entirely the demand from the economy, all the more so when foreign exchange restrictions are imposed, the black

market may be a last resort, being a residual market influenced by the official market supply-demand conditions. In this case, interventions of the SBV on the official market, and changes in the OER, are susceptible to influence the black market supply-demand conditions and then the BER. The smallness of the black market may then explain that changes in the BER would be amplified, in the short-run, compared to changes in the OER determined in the larger official market.

Because the official market is at an initial stage of development in which forward trading and option contracts on foreign exchange remain thin or even absent (Phuc and Duc-Tho, 2009), another relationship between both markets and exchange rates may emerge. Indeed, it is likely that the SBV takes information from the black (or "free") market and changes in the BER (or the gap between the BER and the OER) as proxies for the equilibrium level of the exchange rate (or for the expected change in the exchange rate). The SBV may then take this information into account to decide its interventions on the interbank market. For instance, in the case of a shock that permanently increases (depreciates) the BER, causing a gap with the OER, the SBV may then decide to increase the OER, by restraining its selling of foreign currencies. However, there could be only a partial adjustment if the SBV does not respond instantaneously and takes other factors into account in its decision to change the OER.

Moreover, it can also be expected that commercial banks take the changes in the BER (or the gap between the BER and the OER) into account in their operations. They can also take the BER as a predictor for the OER, particularly if they consider that the SBV takes the BER into account, voluntarily or under constraints. In the case of speculation and self-fulfilling expectations, if the BER is higher than the OER, the banks may anticipate that the OER will increase. Then banks may buy the USD (to sell it at a higher price later). If these transactions are large enough and are not compensated by other factors (or the interventions of the SBV), the OER may then effectively increase.

II.3. EMPIRICAL WORKS ON THE RELATIONSHIP BETWEEN BLACK AND OFFICIAL EXCHANGE RATES

The empirical literature on the relationship between the OER and the BER in developing countries gathers works that focus on a group of countries, or on only one country, using

time series at different frequencies, testing cointegration and exogeneity. Results are highly country-specific: while a long-run relationship may be found between the OER and the BER, the intensity of the relationship and causality may differ.

Regarding multi-country studies, Agenor et Taylor (1993) study the causality between OER and BER in 19 developing countries using VECM and cointegration analysis on monthly data covering a 13-year period. Their results show that a long-run relationship between the OER and the BER hold in 13 countries, thanks to changes in the BER only in 6 countries, changes in the OER only in 5 countries, and changes in both rates in 2 countries. Bahmani-Oskooee et al (2002) test for a long-run relationship between the BER and the OER for a sample of annual data covering 49 countries over 1973-1990 using panel cointegration techniques. They find a long-run relationship between both rates that are obtained mainly through OER adjustment. Bahmani-Oskooee and Goswami (2004) examine the relationship between OER and BER over 1955-1995 in 31 developing countries employing Johansen's cointegration analysis. They find cointegration between both rates in 15 countries and that the relationship held only through adjustment of the OER in 8 countries. Diamandis and Drakos (2005) investigate the long-run dynamics of OER and BER in Argentina, Brazil, Chile, and Mexico employing monthly data for the period 1973:10 to 1993:12. They discover evidence of a long-run relationship between both rates in these countries, with an adjustment of the BERs. However, adjustment speeds of the BERs vary between countries. Kula et al (2014) use monthly data for a sample of 13 Middle East and Northern African (MENA) countries from 1970 to 1998 and Pool Mean Group estimators. They obtain evidence of a common long-run relationship between the OER and the BER across the sample (the long-run coefficient equals one), but short-run dynamics are heterogeneous.

Regarding single country studies, for instance, Booth and Mustafa (1991) investigate the relationship between the BER and the OER of Turkey pound to the US dollar and West German mark in the mid-1980s. For both cases, they find that the BER and the OER are cointegrated. When disequilibria occur, the BERs and the OERs adjust toward the equilibrium levels, however, the speed of adjustments of the BERs are higher than those of the OERs. Baghestani and Noer (1993) find a similar long-run relationship between the OER and the BER in India using quarterly data over 1973–1990. The BER is more sensitive than the OER to shocks, and the BER also adjusts more rapidly than the OER

to allow the long-run relationship to hold. Kouretas and Zarangas (2001) examine the relationship in Greece over 1975-1993 using monthly data. They find a long-run relationship between both rates with an adjustment of the BER only. Love and Chandra (2007) examine the relationship between the OER and the BER in India in the 1953-1993 period with monthly data. Both rates are cointegrated, and the BER is weakly exogenous, while the OER converges to the equilibrium level defined by the long-run relationship. Baliamoune-Lutz (2010) investigates the long-run relationship between the OER and the BER and short-run dynamics in Morocco from January 1974 to December 1992. He finds a long-run equilibrium relationship between both rates and that the BER adjusts to the equilibrium level.

Papers focusing on the link between the OER and the BER in Vietnam are sparse. To our knowledge, only Bui (2018) performs an empirical test about this relation over a very short period, January 2005 to April 2011 using monthly data. Applying VECM and Granger tests, she finds a long-run relationship between the two rates, the OER causing the BER in the short-run, but reject the efficiency hypothesis of the black market.

However, several qualitative researches mentioned this relationship to show difficulties in implementing the exchange rate policy in Vietnam (Phuc and Duc-Tho, 2009; IMF, 2010; Nguyen et al, 2010; Bui et al, 2017). Phuc and Duc-Tho (2009) stated that changes in the parallel exchange rate may have served as a guide for the OER, the SBV aiming at reducing the gap between both rates in some periods of time. IMF (2010) mentioned the relationship between the OER and the BER, specifically when the VND depreciated in late 2009. Nguyen et al (2010) analyzed the cause of the strong depreciation of the OER in 2008-2009. They argued that an increase in the demand of USD combined with a limited supply in the official market leads the firms and individuals to buy the USD in the black market. Consequently, the BER significantly depreciated causing larger gaps between both rates, which eventually forced the SBV to depreciate the OER to eliminate these gaps.

II.4. EMPIRICAL MODEL, METHODOLOGY AND DATA

We follow the usual framework that analyze the long-run relationship between the OER and the BER in empirical works, as follows:

$$OER_t = a + b.BER_t + \varepsilon_t \qquad (t = 1,\ldots..T) \qquad (1)$$

Where OER_t is the logarithm of the official exchange rate, BER_t the logarithm of the black market exchange rate, and ε_t is the error term. b is the long-run elasticity between both rates, and a is a constant.

The arguable question is whether OER_t (BER_t) would depart from BER_t (OER_t). The portfolio balance models are frequently used to explain the long-run and the short-run dynamics of the black exchange rate, for example employed by Black (1973), Kouri (1976), Girton and Henderson (1977), Branson (1980), and Frankel (1984). The models indicate that the BER is determined by the conditions in asset markets, but the current account affects the black exchange rate through the change of the stock of foreign currencies in the black market. The portfolio balance models help to explain the existence of the so-called black-market premium, the difference between the black and the official exchange rates.

Another implication of the portfolio balance models is that the black and the official exchange rates must change proportionally. It means that the coefficient b should equal 1, and then the black-market premium should be a constant. However, in the short-run, the economic agents operating in the black market may anticipate profits if the value of foreign currencies increases. They will increase their demand and decrease their supply of foreign currencies in the short-run, leading the black exchange rate premium to spread. When the black exchange rate premium increases, it would cause a current account surplus, following the undervaluation, and leads to a rise in the stock of foreign exchange in the black market. However, the black premium would decrease when the official exchange rate depreciates. The temporary accumulation of the foreign currency in the black market will be removed through the reserve effect on the current account when the black market premium decreases. Consequently, the black-market premium should be a constant in the long-run.

In this study, following a conventional cointegration analysis, unit root tests are first performed to examine the characteristics of the series of OER and BER.

Second, we apply the cointegration analysis method developed by Johansen (1995), by estimating a VECM of the form:

$$\Delta Yt = \alpha\beta' Yt\text{-}k + \sum \Gamma t\, \Delta Yt\text{-}i + Dt + \varepsilon t \qquad (2)$$

where Yt = [OERt, BERt], β' denotes the matrix of parameters of the co-integrating vector, β'Yt-k is the long-run relationship, α is the matrix of the parameters of equilibrium-correction, Γt is the matrix of short-run parameters, Dt denotes deterministic components (constants, centered seasonal dummies, and trends) and εt is the vector of error-terms.

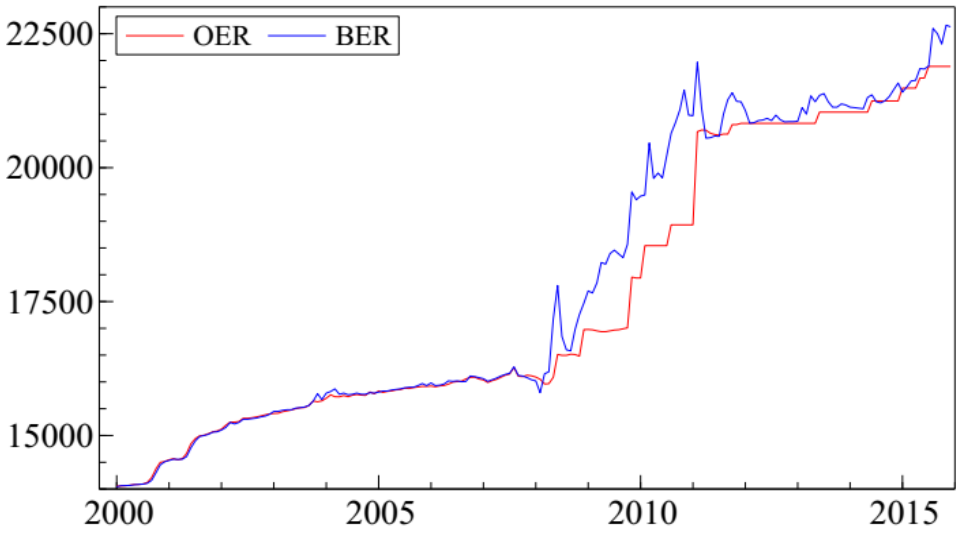
This approach allows us to investigate a long-run relationship and the short-term dynamics in both markets and exchange rates, and the adjustment of both in response to short-run deviations from the long-run equilibrium.

Monthly data of the (end-of-period) OER are from the International Financial Statistics (IMF). Getting data on the BER is challenging since the black market is informal and scattered across the country. Ideally, an average of the multiple exchange rates from all domestic black markets would be an adequate measure. However, primary data are obviously unavailable in practice. Here, we use the BER observed in the black market at the capital city of Hanoi, which is the only available historical series to our knowledge. The BER is a selling rate, measured at the end of period, which comes from the SBV and the Vietcombank (The Joint Stock Commercial Bank for Foreign Trade of Vietnam) that have partially published or give informal access to these data.

As mentioned in section 2, since January 2016 the SBV set a managed floating regime for the OER against a basket of eight currencies, replacing the managed peg to the USD. Considering that it may influence the nature of the relationship between the OER and the BER, of the VND against the USD, the sample is then chosen to cover the period from January 2000 to December 2015.

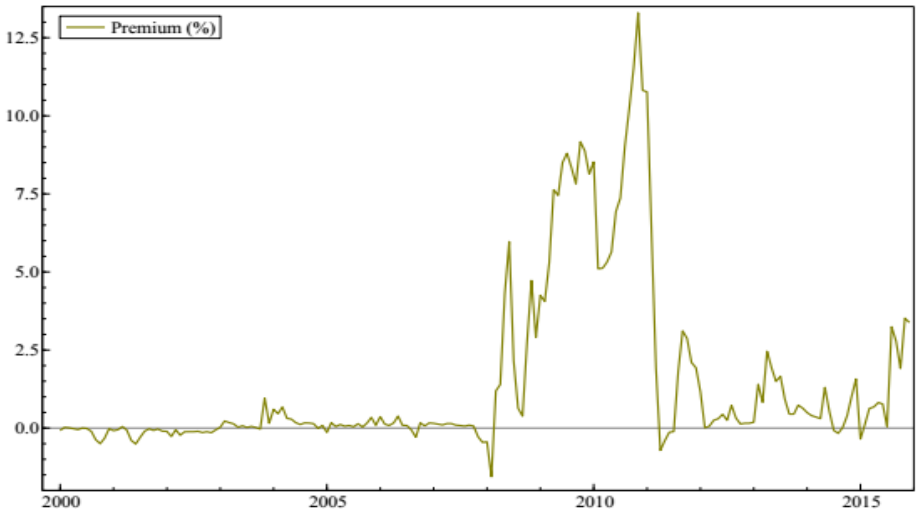
As observed in Figure II.4, the BER and the OER gradually, and closely, depreciated in the 2000-2007 period. They sharply rose in 2008-2011 with the global financial crisis and domestic macroeconomic imbalances, and the gap between both rates – the black market premium – sharply increased. The premium has diminished since the mid-2011, but increased again in 2015, as shown in Figure II.5.

Figure II.4. The OER and BER (VND/USD)



Source: The SBV and Vietcombank.

Figure II.5. Black market premium (%)



Source: Author's calculation.

II.5. EMPIRICAL RESULTS

Table 2.1 and 2.2 present the results of unit root tests of the Augmented Dickey-Fuller (Dickey and Fuller, 1981), and Phillips-Perron (Phillips and Perron, 1988) tests that

indicate that both variables are non-stationary and integrated at the first order I(1), allowing a cointegration relationship to exist between them.

Table II.1. Unit root tests of the BER and the OER

Variables	With trend				Without trend			
	X		ΔX		X		ΔX	
OER	(1)	-1.393	(0)	- 13.85***	(1)	- 0.521	(0)	- 13.88***
BER	(4)	-1.296	(3)	- 8.477***	(4)	- 0.625	(3)	- 8.49***

Notes:
1. The ADF tests include a constant and seasonal dummies, with or without a deterministic trend.
2. The lags length chosen according to the AIC criterion is given in parentheses.
3. The critical values used are – 4.01 and – 3.46 with or without trend at 1% critical values, respectively.
4. *** Rejection of null hypothesis of a unit root at a significance level of 1%.

Table II.2. Phillips-Perron unit root test

Variables	With trend				Without trend			
	X		ΔX		X		ΔX	
OER	(4)	-1.489	(4)	-14.03	(4)	- 0.147	(4)	-14.06
BER	(4)	-1.734	(4)	-14.47	(4)	- 0.204	(4)	-14.51

Notes:
1. The Phillips-Perron tests include a constant, with or without a deterministic trend.
2. Test critical values (without trend): 1% level is -3.48; 5% level is -2.88, 10% level is -2.57.
3. Test critical values (trend): 1% level is -4.01; 5% level is -3.44, 10 % level is -3.14.

Monthly time series usually impose to include seasonal dummies into the VECM. Particularly, Vietnam's economy is characterized by a high seasonality with boiling activities at the end and the beginning of every year, with probable consequences on the exchange rates. Using monthly series also invites to use a lag length of 12 months that allow to eliminate residuals autocorrelation. Large exchange rate changes in some periods are the cause of the non-normality of the residuals. The stability tests show that the VECM is stable in the study period (appendix). However, they display some breaks in the period 2008-2011 that would be associated with the non-normality in VECM residuals.

We follow previous studies in choosing the specification with a restricted constant in the cointegrating vector and an unrestricted constant in the VAR. Moreover, including a deterministic trend in the cointegrating space, while not greatly improving the overall specification, generated implausible preliminary results with poor economic sense (results are available on request from the author). Results are reported in table 3. The trace tests confirm the existence of one cointegrating vector signaling a long-run relationship between the BER and the OER. Unrestricted adjustment coefficients and standardized eigenvectors show that the parameter of the cointegrating vector is close to 1, and the adjustment coefficient of the OER is higher than the one of the BER.

Table II.3. VECM residuals diagnostic statistics of vector Y={OER, BER}

II.3.1. VECM residuals diagnostic statistics

	AR(1)	***AR(12)***	***JB***	***ARCH***	***H***
Y	0.11 [0.98]	1.36 [0.07]	277.9 [0.00]		2.37 [0.00]
OER	0.14 [0.71]	1.37 [0.19]	135.6 [0.00]	0.16 [0.99]	2.84 [0.00]
BER	0.10 [0.76]	1.24 [0.26]	105.7 [0.00]	2.08 [0.05]	1.42 [0.06]

II.3.2. Reduced rank statistic

Eigenvalues	***H0: rank ≤***	***Trace test***
	0	22.57 [0.02]**
0.1185	1	2.56 [0.67]
0.0138	2	

II.3.3. Adjustment coefficients and standardized eigenvectors (scale on diagonal)

α	***α1***	***α2***
OER	-0.19	-0.002
BER	-0.09	-0.019

β	***β1***	***β2***
OER	1	-0.96
BER	-0.97	1
Constant	-0.30	-0.44

II.3.4. Adjustment coefficients and restricted eigenvectors

II.3.4.1. Adjustment coefficients and restricted eigenvectors: α(OER) =0.

LR test of restrictions: $\chi 2(1) = 14.89$ [0.00]***

α	***α1***
OER	0
BER	0.05 (0.03)

β	***β1***
OER	1
BER	-0.99 (0.10)
Constant	-0.03 (1.01)

II.3.4.2. Adjustment coefficients and restricted eigenvectors: α(BER)=0.

LR test of restrictions: $\chi2(1) = 2.087$ [0.149]

α	***α1***
OER	-0.16 (0.04)
BER	0

β	***β1***
OER	1
BER	-0.97 (0.02)
Constant	-0.28 (0.22)

II.3.4.3. Adjustment coefficients and restricted eigenvectors: α(BER)=0 and β(BER)= -1.

LR test of restrictions: $\chi2(2) = 3.266$ [0.195]

α	***α1***
OER	-0.14 (0.04)
BER	0

β	***β1***
OER	1
BER	-1
Constant	-0.007 (0.005)

Notes:

1. AR (1) and AR (12) are LM tests for first-order and 1 to 12 order autocorrelation; JB is the Jarque-Bera test for normality; ARCH is LM test for conditional heteroscedasticity; H is the White test for heteroscedasticity.
2. Marginal significance levels of the test statistics are presented in square brackets.
3. Standard errors of coefficients estimated are in parentheses.

The cointegrating vector can be represented in the form of the following long-run relationship: $OER_t = 0.97*BER_t + 0.3$.

The coefficient of BER is close to one. It implies that both rates show similar changes in the long-run. Moreover, the results of testing the restriction that coefficient b=1 in the equation (1) is reported in table II.3.4.3, which is not rejected with the probability of the Likelihood-ratio test $p \approx 0.2$. It implies that the black market premium is constant in the long-run.

We apply weak exogeneity tests in the form of restrictions on adjustment parameters. The test results are reported in table II.3.4.1 – II.3.4.2. The results show that the BER is weakly exogenous while the OER is not: only the changes in the OER, not the change in the BER, are driven by the deviation from the long-run relationship. The error-correction parameter of OER is - 0.19 indicating that the OER changes decrease the gap between both rates by approximately 19% per month. In other words, approximately 4 months are necessary to

eliminate 50% of the deviation from the equilibrium levels. This level of adjustment speed of the OER seems reasonable compared to, for example, Love and Chandra (2007)' (too) small estimate of 1.7% per month in India or Diamandis and Drakos (2005)'s (too) large estimates of 68% to 88% per month. Moreover, this level of adjustment speed of the OER in Vietnam signals that the SBV implemented a controlled adjustment of the OER, following the changes in the BER, but with a certain inertia explained by the aim to avoid large depreciation of the OER. However, the conclusion is that changes in the BER lead the SBV to adjust the OER to eliminate the gap between both rates in the long-run. It can not reject the hypothesis that the SBV employs the BER to form its exchange rate expectations or as a proxy for the exchange rate equilibrium level to be targeted.

The fact that the BER is weakly exogenous deserves discussions. The result is consistent with earlier studies by Bahmani-Oskooee et al (2002), Bahmani-Oskooee and Gosmani (2004), and Love and Chandra (2007) in other contexts. It would reveal that the black market is relatively autonomous vis-à-vis the official market and does not present itself as a simple residual market. In the long-run, supply-demand conditions in the official market do not affect supply-demand conditions in the black market. Moreover, agents operating in the black market do not use information from the official market, which would be revealed by current changes in the OER, in a simple way. It would inversely reveal that agents in the black market use external information, that would allow them to form specific expectations on the exchange rate, which, under self-fulfilling expectations, affect the current BER.

The Johansen's cointegration analysis method uses a full VECM specification that includes both the short-run dynamics and the error-correction mechanism for the long-run relation. Following a general-to-specific method (by deleting progressively the variables indicating no significant impact), we explore the short-run dynamics of both rates. The results are reported in table II.4. For both equations, the results reveal inertial processes with a significant impact of lags to up to 11 months. Regarding cross-effects, in the ΔOER equation, changes in the BER cause changes in the OER in a similar direction. Inversely, results of the ΔBER equation indicate that changes in the OER cause changes in the BER but with a quite complex dynamic. The one and two-period lagged OER has a negative impact on the BER while the 6-periods lagged OER has a positive impact. In other terms, a depreciation (appreciation) of the OER would cause an

appreciation (depreciation) of the BER in the very short-run. Besides the complex self-fulfilling expectation process, an interpretation would be that, under a controlled foreign exchange regime, the SBV may allow depreciation of the OER but together with the selling of the USD in the official market to reduce pressures. A part of these USD amounts might then fuel into the black market and cause a temporary appreciation of the BER.

Table II.4. VECM for the ΔOER and the ΔBER equations, 2000:1 – 2015:12

ΔOER		ΔBER	
Variable	Coefficient	Variable	Coefficient
ΔOER_{t-4}	-0.27 (0.06)***	ΔOER_{t-1}	-0.23 (0.09)***
ΔOER_{t-7}	-0.18 (0.06)***	ΔOER_{t-2}	-0.32 (0.08)***
ΔOER_{t-11}	-0.14 (0.07)**	ΔOER_{t-6}	0.23 (0.09)**
ΔBER_{t-2}	-0.18 (0.05)***	ΔBER_{t-8}	0.14 (0.06)**
ΔBER_{t-7}	0.18 (0.05)***	ΔBER_{t-11}	0.26 (0.07)***
ΔBER_{t-11}	0.22 (0.05)***		
EC_{t-1}	-0.11 (0.02)***		
Constant	0.003 (0.001)***	Constant	0.002 (0.001)**
AR (1): 0.98 [0.32]		AR (1): 0.47 [0.49]	
ARCH: 0.08 [0.77]		ARCH: 11.0 [0.00]	
JB: 92.45 [0.00]		JB: 64.02 [0.00]	
H: 5.77 [0.00]		H: 1.69 [0.04]	
R^2: 0.40		R^2: 0.30	
Adj R^2: 0.30		Adj R^2: 0.20	

Notes:

1. AR (1) are LM tests for first-order autocorrelation; JB is the Jaque-Bera test for normality; ARCH is LM test for conditional heteroscedasticity; H is the White test for heterosdasticity.
2. Marginal significance levels of the test statistics are presented in square brackets.
3. Standard errors of coefficients estimated are in parentheses.
4. ***, **, * are significant levels of the test statistic at 1%, 5%, 10%, respectively.
5. The coefficients of seasonal dummies is not listed in the table because they are not study objective.

We return to the question of market efficiency. Booth and Mustafa (1991), and Kouretas and Zarangas (2001) argue that the presence of cointegration and error-correction mechanism is incompatible with the hypothesis of informational efficiency in the asset market. If a model shows an error-correction mechanism, it indicates a reaction from one

market to the other. Therefore, the hypothesis of market efficiency is violated because past information on one exchange rate can not be used to forecast the following value of the other. The absence of a cointegration relationship between the two exchange rates implies a weak-form of information efficiency of these markets. The results of estimating ΔOER_t equation in Table 4 display that the error-correction coefficient is negative and significant. It indicates the absence of information efficiency in the official market because the economic agents use past information on the black exchange rate to predict the following values of the official exchange rate. When the black market premium departs from the long-run equilibrium level, the official exchange rate will adjust to eliminate the premium. Our result is consistent with the previous work of Bui (2018). However, we find that only the official exchange rate adjusts to eliminate short-run fluctuations from the equilibrium level, while Bui (2018) finds that the black exchange rate also adjusts to remove the black market premium.

CONCLUSION

In this study, we examine the long-run relationship and the short-run dynamics of the official and the black exchange rates in Vietnam during the period from January 2000 to December 2015. Applying the Johansen's cointegration method, our results reveal that both rates are cointegrated, implying that both markets are not fully segmented. Moreover, the black market exchange rate is weakly exogenous while only the official exchange rate adjusts to correct gaps with the black exchange rate by approximately 16% per month. Then, the interpretation would be that the SBV intervene to unify both rates progressively in the long-run and that the BER might be used by SBV as a proxy for the equilibrium exchange rate and expectation of exchange rate change. Short-run dynamics also show that changes in both rates mutually influence each other. Finally, the *de facto* exchange rate policy implemented by the SBV over 2000-2015 probably used the black market conditions into account, while *de jure* rules remained silent about that. This would have been at the basis of the change in the exchange rate regime applied in 2016 that aims at allowing more flexibility. In addition, the new regime does not give a role to the black market, but it seems obvious that this role would remain for a time. This role would reduce progressively with sufficient flexibility of the official exchange rate, and lower exchange restrictions, which would reduce the incentives of economic agents to go to the black

market. The development of an official forward market for exchange rates would also aim at reducing the role of the black market.

References

Agénor, P. R. (1990). Parallel currency markets in developing countries: theory, evidence, and policy implications. *IMF Working Paper*, Vol., pp. 1-52, 1990.

Agénor, P-R., and Taylor, M.P. (1993). The causality between official and parallel exchange rates in developing countries. *Applied Financial Economics* 3.3: 255-266.

Baghestani, H., & Noer, J. (1993). Cointegration analysis of the black market and official exchange rates in India. *Journal of Macroeconomics*, 15(4), 709-721.

Bahmani-Oskooee, M., Miteza, I., & Nasir, A. B. M. (2002). The long-run relation between black market and official exchange rates: evidence from panel cointegration. *Economics Letters*, 76(3), 397-404.

Bahmani-Oskooee, M., & Goswami, G. G. (2004). Long-run nature of the relationship between the black market and the official exchange rates. *Economic Systems*, 28(3), 319-327.

Black, S. W. (1973). International money markets and flexible exchange rates. *Studies in International Finance, no. 25.* Princeton University.

Booth, G. G., & Mustafa, C. (1991). Long-run dynamics of black and official exchange rates. *Journal of International Money and Finance*, 10(3), 392-405.

Branson, W. H. (1980). Asset markets and relative prices in exchange rate determination (No. 20). *International Finance Section, Department of Economics, Princeton University.*

Bui M. T. (2018), Causality in Vietnam's Parallel Exchange Rate System during 2005–2011: Policy Implications for Macroeconomic Stability, Economies, 6, 68; doi:10.3390/economies6040068

Bui, D.H., Makin, A.J., and Ratnasiri, S. (2017). Is Vietnam's exchange rate overvalued? *Journal of the Asia Pacific Economy*, 22:3, 357-371.

Diamandis, P. F., & Drakos, A. A. (2005). Long-run dynamics of official and black-market exchange rates in Latin America. *Global Finance Journal*, 15(3), 219-237.

Dickey, D. A., & Fuller, W. A. (1981). Likelihood ratio statistics for autoregressive time series with a unit root. *Econometrica: Journal of the Econometric Society,* 1057-1072.

Edwards, S. (1989). Real exchange rates, devaluation, and adjustment: exchange rate policy in developing countries. *Cambridge, MA: MIT press*, 1989.

Eichengreen, B. (2007). The Real Exchange Rate and Economic Growth. *Social and Economic Studies,* 56, 4, p.7-20.

Frankel, J. A. (1984). Tests of monetary and portfolio balance models of exchange rate determination. *In Exchange rate theory and practice* (pp. 239-260). *University of Chicago Press.*

Gala, P. (2008). Real exchange rate levels and economic development: theoretical analysis and econometric evidence. *Cambridge Journal of Economics,* 32, 2, p. 273.

Girton, L., & Henderson, D. (1977). Central bank operations in foreign and domestic assets under fixed and flexible exchange rates. *In the effects of exchange rate adjustment*, ed. Clark, P., Logue, D., and Sweeney, R. Washington: United States Treasury.

Ghei, N., Kiguel, M. A., & O'Connell, S. A. (1997). Parallel Exchange Rates in Developing Countries: Lessons from Eight Case Studies. *In Parallel Exchange Rates in Developing Countries* (pp. 17-76). Palgrave Macmillan, London.

IMF. (1996). Vietnam transition to a market economy. *IMF occasional paper* No.135.

IMF. (2009). *IMF country report* No.09/110, April 2009.

IMF. (2010). Vietnam: Article IV consultation: Staff report and public information notice.

Johansen, S. (1995). Likelihood-based inference in cointegrated vector autoregressive models. *Oxford University Press* on Demand.

Kiguel, M., & O'Connell, S. A. (1995). Parallel exchange rates in developing countries. The *World Bank Research Observer,* 10(1), 21-52.

Kouretas, G. P., & Zarangas, L. P. (2001). Long-run purchasing power parity and structural change: The official and parallel foreign exchange markets for dollars in Greece. *International Economic Journal*, 15(3), 109-128.

Kula F., Aslan A., Ozturk I. (2014), Long Run Tendencies and Short Run Adjustments Between Official and Black Market Exchange Rates in MENA Countries. *International Journal of Economics and Financial Issues,* Vol. 4, No. 3, 2014, pp.494-500.

Kouri, P. J. (1976). The exchange rate and the balance of payments in the short run and in the long run: A monetary approach. *The Scandinavian Journal of Economics, 280-304.*

Love, J., & Chandra, R. (2007). The relationship between the black market and official exchange rates: an examination of long run dynamics in Indian. *Scottish Journal of Political Economy,* 54(2), 283-294.

Nguyen, V. T. (2006). International finance. *Hanoi: Statistic Publisher*. (in Vietnamese).

Nguyen, T.T.H., & Dinh, T.M., & To, T.T., & Le, H.G., and Pham, V.H. (2010). Vietnam annual report 2010: The choice for sustainable growth - Chapter 4. *Nhà Xuất Bản Tri thức,* Hà Nội, 6/2010 (in Vietnamese). Link: http://dl.ueb.vnu.edu.vn/bitstream/1247/52/2/NC-21.pdf

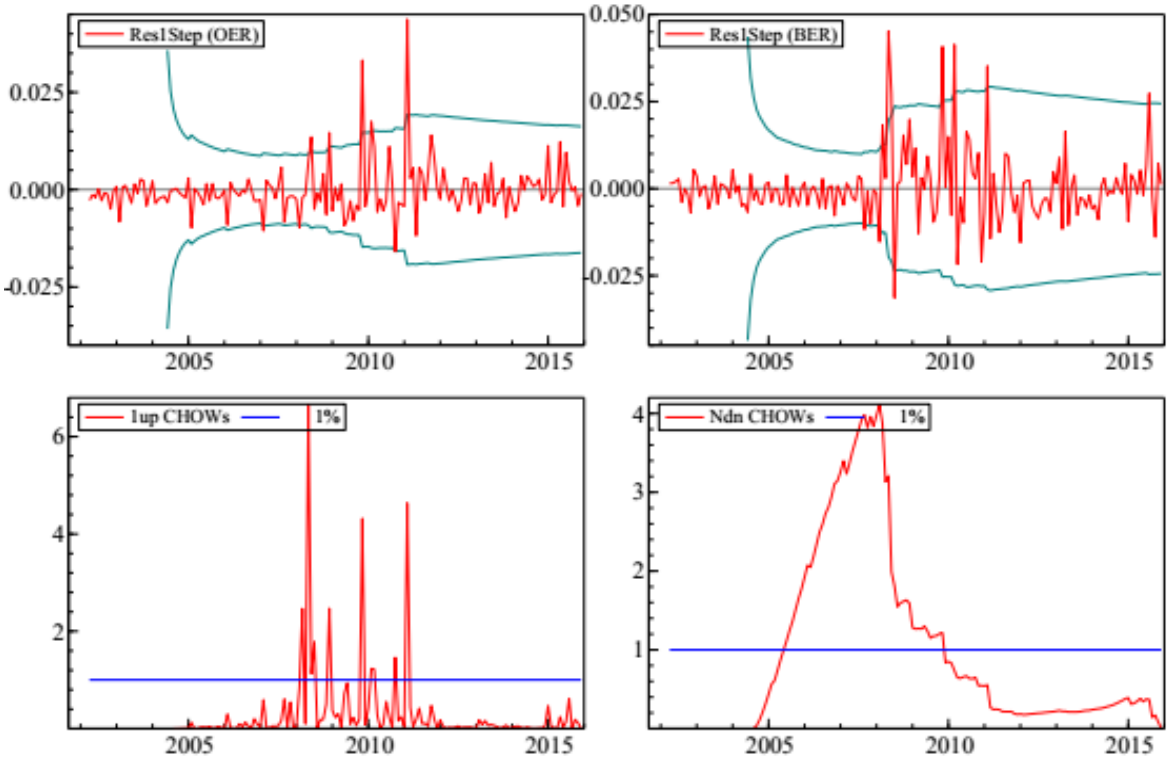
Phuc, N. T., & Duc-Tho, N. (2009). Exchange rate policy in Vietnam, 1985–2008. *ASEAN Economic Bulletin*, 26(2), 137-163.

Rodrik, D. (1986). Disequilibrium Exchange Rates as Industrialization Policy. *Journal of Development Economics,* 23(1), September 1986.

Rodrik, D. (2008). The Real Exchange Rate and Economic Growth. *Brooking Papers on Economic Activity,* fall, 2, p.365-412.

Vo, T.T., Dinh, H.M., Do, X.T., Hoang, V.T., and Pham, C.Q. (2000). Exchange rate arrangement in Vietnam. *East Asian Development Network,* December 2000.

Appendix. Tests of specification stability.



Note. The graphs depict the one-step residuals, the one-step Chow test (1-up), the break-point Chow test (N-down).

CHAPTER III.

DISEQUILIBRIUM REAL EXCHANGE RATE AND MISALIGNMENT IN VIETNAM, 1990-2016

INTRODUCTION

The exchange rate plays a significant role in international trade and economic performances of an open economy. The changes or the volatility of the exchange rate are often caused by exogenous shocks that are hardly manageable by developing countries. They have consequences on international trade, the balance of payments, and ultimately economic performances (Razin and Collins, 1999; Prasad et al, 2007; Gala, 2008). Therefore, the monetary authorities in developing economies repeatedly target an appropriate level of the exchange rate.

Regarding exchange rate management issues, the *real* exchange rate (RER) is conventionally considered as the central variable in theoretical and empirical works. It is a measure of competitiveness in the production of tradable goods and services of a country compared with its trading partners. However, the concepts and the measures of the RER remain challenging in empirical works, particularly for those covering developing economies (Edwards, 1988; Hinkle and Montiel, 1999). The various measures of the RER are usually categorized into either internal RER or external RER. The internal RER is the relative price of the domestically-produced tradable goods to non-tradable goods. The external RER is the nominal exchange rate adjusted for the relative prices between the domestic and foreign countries. External RER is more often used than the internal RER because it requires data that are more available in developing countries. The external RER is then the usual variable to estimate the so-called equilibrium RER level and misalignments (undervaluations or overvaluations) which are an important issue in macroeconomic management.

The assessment of RER misalignment in Vietnam has only been studied by a few works. For instance, IMF (2006) shows that the RER depreciated in the period 1997-2005, but more recently, the RER is often considered as overvalued, weakening the country's competitiveness in international trade (Nguyen and Nguyen, 2009; Nguyen et al, 2010). However, Bui et al. (2017) in a recent econometric estimate of the equilibrium RER and misalignment using data covering the period 1995: Q4 - 2014: Q2, show that the misalignment of the RER is not durable and varies over time. Therefore, the question of RER misalignment is still a timely issue, particularly for Vietnamese authorities that would target a good level of the RER.

In this chapter, we investigate the misalignment of the exchange rate in the period 1990-2016 to contribute to the existing literature on the exchange rate management in Vietnam. This study is organized as follows. Section III.1 presents the method and the results of the measure of the RER in Vietnam. Section III.2 examines the PPP theory for bilateral and multilateral exchange rates in Vietnam. Section III.3 investigates the long-run equilibrium RER and misalignment. The last section concludes.

III.1. MEASURING REAL EXCHANGE RATES

III.1.1. Theory and empirics

Concepts and measures of the RER have long been debated in empirical works, especially in those that cover developing countries. Hinkle and Montiel (1999) already advocated for the need to measure RER in different ways to obtain an appropriate assessment. The measures of RER can be classified into two groups, either internal RER (IRER) or external RER (ERER).

The IRER is based on the dependent economy or the Scandinavian model in which the total production and expenditure of an economy are divided into two categories of goods and services, the tradable (importable and exportable) goods and the non-tradable goods (Salter 1959, Swan 1960, Aukrust 1977). The IRER is defined as the relative price of tradable to non-tradable goods in the domestic economy, as follows:

$$\text{IRER} = \frac{P_T}{P_N} \qquad (1)$$

where P_T is the internal price of tradable goods and P_N is the internal price of non-tradable goods. The IRER reflects the relative incentives, or the relative internal competitiveness, of producing and consuming tradable goods in comparison with non-tradable goods. An increase in the IRER promotes the domestic production of tradable goods against the production of non-tradable goods. Production factors in the domestic economy, therefore, will move from the non-tradable goods sector into the tradable goods sector. An increase in the IRER would also weaken the domestic consumption of tradable goods against the consumption of non-tradable goods, then potentially favoring exports and refraining imports.

Under the Law of One Price and ignoring taxes, costs of transportation and transaction, the domestic prices of tradable goods (in domestic currency) equals the foreign prices of tradable goods (in foreign currency): $P_T = E.P_T^*$, where E is the nominal exchange rate defined as the number of units of domestic currency for one unit of foreign currency and P_T^* is the foreign price of tradable goods.

The IRER becomes,

$$\text{IRER} = \frac{EP_T^*}{P_N} \qquad (2)$$

The external RER (ERER) is defined as the nominal exchange rate adjusted for relative price levels between the country and its trading partners. It compares the relative prices of baskets of production and consumption of goods between countries. For this reason, it measures the external competitiveness of a country with its trading partners.

$$\text{ERER} = \frac{EP^*}{P} = E\frac{P^*}{P} \qquad (3)$$

where E is the nominal exchange rate, P^* and P are indices of foreign and domestic prices, respectively. An increase in E (a nominal depreciation of the exchange rate) or in P*/P (a faster rise of foreign price level than of domestic price level), leads to a rise in the ERER (a real depreciation), favoring external competitiveness. Inversely, a decrease in ERER is a real appreciation.

The relationship between IRER and ERER

This relationship has been explained by Hinkle and Montiel (1999). The price levels of goods from equation (3) are composed of the prices of non-tradable and tradable goods.

$$P = P_T^{\theta} P_N^{1-\theta} \qquad (4)$$

$$P^* = P_T^{\lambda *} P_N^{(1-\lambda)*} \qquad (5)$$

where P_T, P_N are prices of tradable and non-tradable goods, respectively, θ is the share of the tradable goods sector in the domestic economy, and λ is the share of the tradable goods sector in the foreign economy.

Substitute (4), (5) in equation (3),

$$ERER = E \frac{P_T^{*\lambda} P_N^{*(1-\lambda)}}{P_T^{\theta} P_N^{(1-\theta)}} \qquad (6)$$

$$ERER = E \frac{P_T^{*\lambda} P_N^{*(1-\lambda)}}{P_T^{\theta} P_N^{(1-\theta)}} = \left(\frac{EP_T^*}{P_T}\right) \left(\frac{\left(\frac{P^*_N}{P^*_T}\right)^{(1-\lambda)}}{\left(\frac{P_N}{P_T}\right)^{(1-\theta)}} \right) = \left(\frac{EP_T^*}{P_T}\right) \frac{IRER^{(1-\theta)}}{IRER^{*(1-\lambda)}} \qquad (7)$$

The ERER is composed of three factors: the relative price of tradable goods between foreign and domestic countries, the internal RER in the domestic economy and the internal exchange rate in foreign economies.

In equation (7), under the Law of one price for tradable goods, the factor of the relative price of tradable goods equals to 1,

$$EP^*_T = P_T \quad \text{and} \quad \frac{EP_T^*}{P_T} = 1 \qquad (8)$$

And then equation (7) becomes

$$ERER = \frac{IRER^{(1-\theta)}}{IRER^{*(1-\lambda)}} \qquad (9)$$

The equation (9) demonstrates that the ERER must show similar variations with the domestic IRER when changes in the foreign IRER are negligible compared to changes in the domestic IRER.

Empirical measures of the RER in developing countries

In empirical works focusing on developing economies, measuring the IRER is a great challenge because of the lack of data on the disaggregated prices of tradable and non-tradable goods. It leads to prefer the measure of the ERER. The ERER can be computed as a bilateral ERER or a multilateral ("effective") ERER. The bilateral ERER is measured as the bilateral nominal exchange rate adjusted by the relative price level between the domestic and a foreign country. The multilateral ERER is called the real effective exchange rate (REER) and is a weighted geometric mean of bilateral ERERs,

$$REER = \prod_{i=1}^{n} \left\{ E_{Di} \cdot \frac{P_{F/i}}{P_{Di}} \right\}^{\omega i} \quad \text{with} \quad \sum_{i=1}^{n} \omega i = 1 \qquad (10)$$

Where E_{Di} is the bilateral nominal exchange rate measured as units of domestic currency per one unit of foreign currency. P_{Fi} and P_{Di} are price levels of foreign country i and of the domestic country. ωi is the trade share of a partner i in total trade of the domestic country.

III.1.2. The measure of the RERs in Vietnam

Statistical series of the bilateral RER (BRER) and the multilateral RER (REER) have not been published for Vietnam. The only existing data of the exchange rate for this country is the nominal bilateral exchange rates of the dong, the Vietnamese currency (denoted as VND) against the United States dollar (USD). Because of the lack of official data, economists have measured the BRER and the REER following different methods, periods, and baskets of currencies. Appendix A reports empirical works on the REER in Vietnam. Almost all these empirical works use the measure of the REER from equation 10 (while sometimes the REER is inversed, being the relative price of domestic to foreign currencies).

Method and data for measuring the RER

In this work, we measure the BRER for Vietnam against different partner countries and the REER over the period from January 1999 to December 2017, using monthly data. The BRER is measured as the nominal bilateral exchange rate adjusted by the relative price index of foreign to domestic economy.

$$\mathrm{BRER_{VN}} = \mathrm{NER_{VN}} \cdot \frac{\mathrm{CPI}^*}{\mathrm{CPI_{VN}}} \qquad (11)$$

where $\mathrm{NER_{VN}}$ is the nominal bilateral exchange rate expressed as the number of units of Vietnamese dong (VND) for one unit of foreign currency. CPI^* and $\mathrm{CPI_{VN}}$ are the consumer price indices of the foreign country and Vietnam, respectively. Therefore, an increase (decrease) in the $\mathrm{BRER_{VN}}$ is a real depreciation (appreciation). The $\mathrm{NER_{VN}}$ and $\mathrm{BRER_{VN}}$ indices are based on January 1999 = 1.

The multilateral REER is measured as a weighted geometric mean of a set of BRER. The basket of currencies gathers the 20 main trading partners of Vietnam: China PR mainland, United State, France, Italy, Germany, Belgium, Netherlands, Canada, China, P.R.: Hong Kong, Japan, Republic of Korea, Singapore, Switzerland, United Kingdom, India, Indonesia, Malaysia, Philippines, Thailand, Russian Federation. These trading partners cover approximately 80% of the total trade of Vietnam over the period. The nominal exchange rates and the consumer price indices are based in January 1999 = 1.

$$\mathrm{REER_i} = \prod_{i=1}^{n} \left\{ \mathrm{E_{VNi}} \cdot \frac{\mathrm{CPI_i}}{\mathrm{CPI_{VN}}} \right\}^{\omega i} = \prod_{i=1}^{n} \mathrm{NEER_i} \cdot \left\{ \frac{\mathrm{CPI_i}}{\mathrm{CPI_{VN}}} \right\}^{\omega i} \qquad (12)$$

where $\mathrm{E_{VNi}}$ is the bilateral nominal exchange rate between Vietnam and the trading partner i expressed as the number of units of VND for one unit of foreign currency. NEER is nominal effective exchange rate $\prod_{i=1}^{n} \left\{ \mathrm{E_{VNi}} \right\}^{\omega i}$. $\mathrm{CPI_{VN}}$, $\mathrm{CPI_i}$ are the consumer price indices of Vietnam and of the trading partner i, respectively. ωi is the weight equaling the share of the trading partner i in total trade of Vietnam with the 20 partners. It is calculated as follows.

$$\omega_i = \frac{(\mathrm{EX} + \mathrm{IM})_i}{\sum_i^n (\mathrm{EX} + \mathrm{IM})_i} \qquad (13)$$

where EX and IM are export and import between country i and Vietnam, respectively.

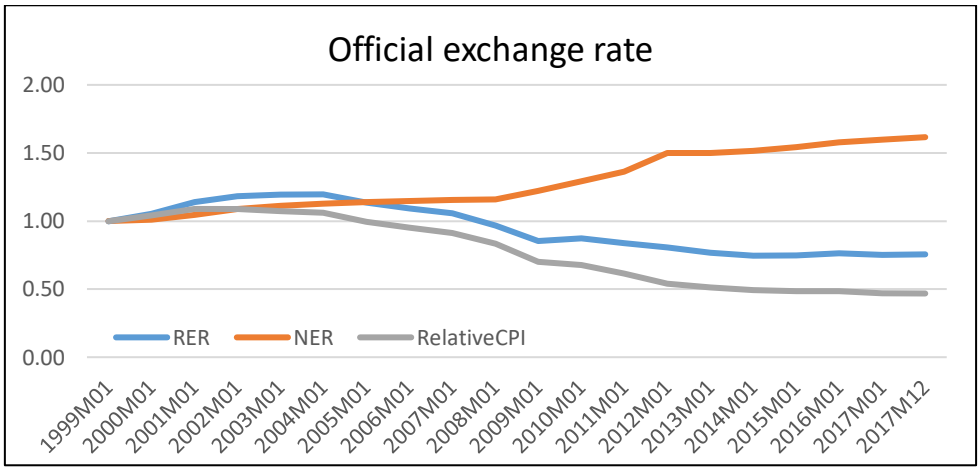
The nominal bilateral exchange rate and the CPIs are extracted from the IMF's International Financial Statistics. The data on export and import values are from the IMF's Direction of Trade Statistics.

III.1.3. Results on measures of real exchange rates

III.1.3.1. The bilateral real exchange rate (BRER)

The results for the NER and the BRER against the US dollar are presented in figure III.1. Over the period, the NER depreciates significantly by 57%. However, the consumer price index of Vietnam increases by 215% while that of the United States rises by 43% only, causing a rapid decrease in the relative CPI of the United States against Vietnam. Consequently, the BRER appreciates approximately by 32% over this period. Although the authorities tried to reduce the value of VND to enhance competitiveness, the prices in Vietnam rose more quickly than in the United States causing appreciation of the BRER over this period.

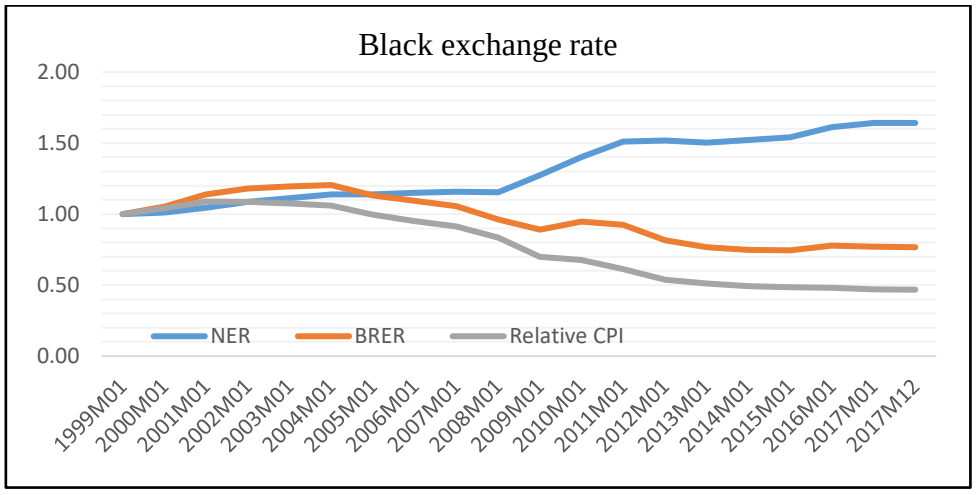
Figure III.1. NER and BRER for official exchange rate, 1999-2017



Source. Author's calculation, data from IFS (IMF).

Figure III.2 presents the NER and BRER using the black exchange rate instead of the official rate. Given that the black exchange rate only marginally deviate from the the official exchange rate, results for the NER and BRER changes are quiet similar to those with the official rate over the period.

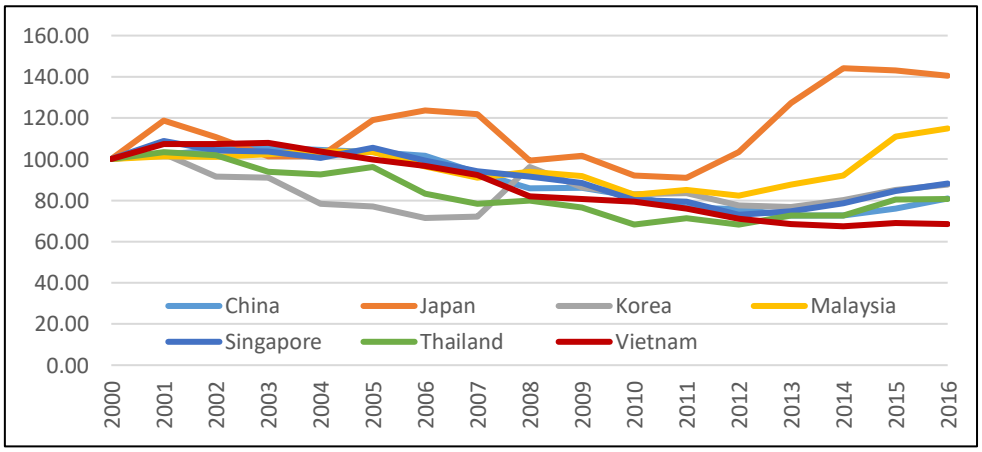
Figure III.2. NER and BRER for the black exchange rate, 1999-2017



Source. Author's calculation, the data is from the IFS (IMF) and SBV.

Figure III.3 presents the BRER of seven Asian currencies against the US dollar in the period of 1999-2017. These countries are trading partners of Vietnam but also potential competitors in international trade. The graph displays a strong appreciation of the BRER against the USD for the currencies of China, Singapore, Korea, Thailand, and Vietnam, while currencies of Japan and Malaysia experience a depreciation against the US dollar. However, compared to partners' currencies, the VND show a stronger appreciation, particularly from the 2010s, that would signal a detrimental trend in its relative competitiveness.

Figure III.3. The Bilateral RER of 7 currencies against USD (1999=100)



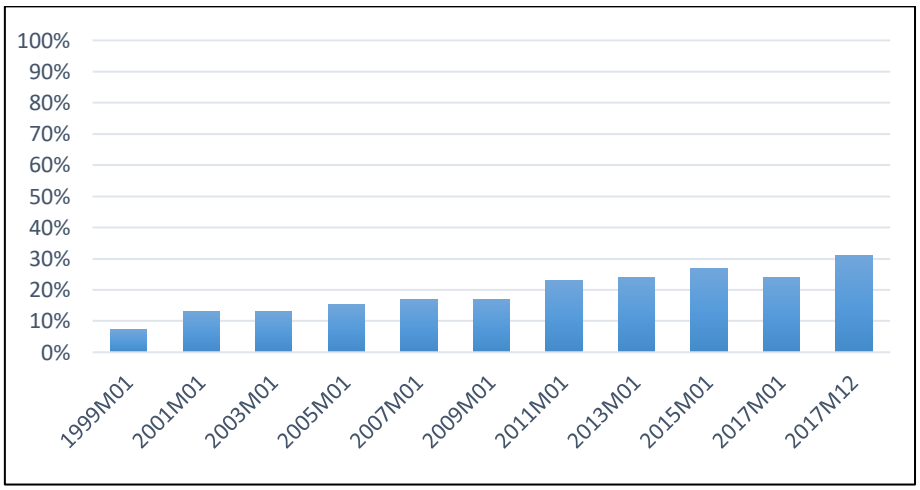
Source: Author's calculation, the data is from the IFS (IMF).

- The bilateral nominal and the RER of VND against Chinese Yuan (CNY)

China has become the most important trading partner of Vietnam. The share of China in the Vietnam trade increased from 7.3% in January 1999 to 15.4% in January 2005, 22.6 % in 2010 and approximately 31% at the end of 2017 (see Figure III.4). China is also one of the most important competitors of Vietnam in world markets.

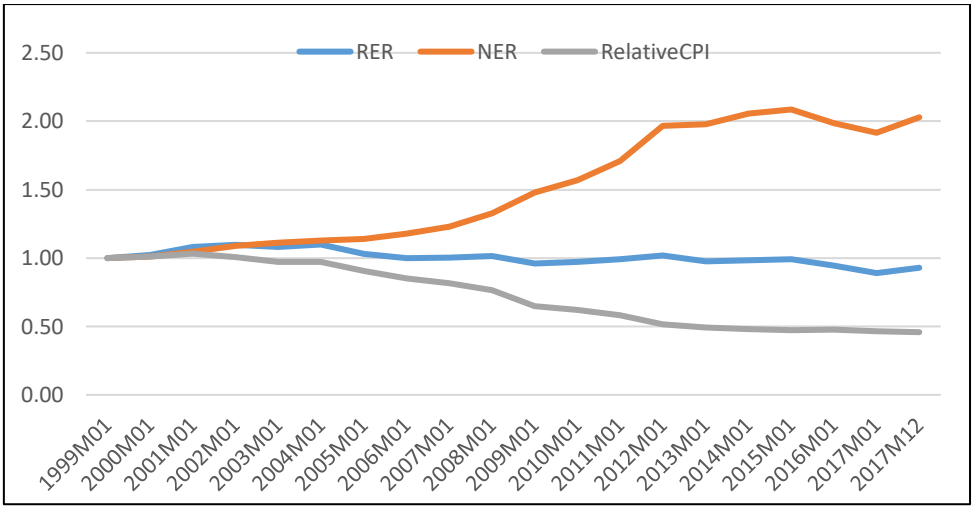
The nominal and real bilateral exchange rates between the VND and the Chinese Yuan are calculated from equation (11). The nominal and real exchange rates depreciated over 1999-2003. Thereafter, the nominal exchange rate depreciated sharply, leading to a cumulated depreciation of 100% between 2003 and 2015. However, it appreciated in 2015-2017. Despite the dramatic NER depreciation over 2003-2015, the RER is stable and only appreciated slightly in 2015-2017 by about 10%. The changes in the nominal and the real exchange rates may imply that the Vietnamese authorities usually depreciate the nominal exchange rate to stabilize the RER in order to maintain the competitiveness of Vietnam against China.

Figure III.4. Share of China in Vietnam total trade 1999-2017



Source: Author's calculation from DOTs data (IMF).

Figure III.5. Nominal and real exchange rates of VND against Chinese Yuan



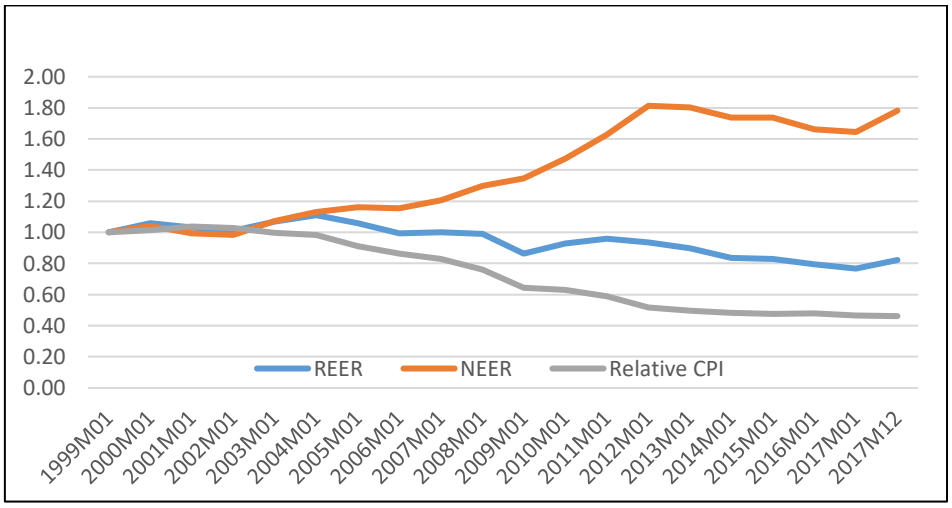
Source: Author's calculation, the data is from the IFS (IMF).

III.1.3.2. Nominal and real multilateral exchange rate, NEER and REER

- The NEER and the REER of Vietnam against some Asian countries

The NEER and the REER are calculated following the equation (12). Figure III.6 presents the NEER and the REER between Vietnam and some Asian countries (Hong Kong, Japan, Korea, Singapore, China, India, Indonesia, Malaysia, Philippines, and Thailand; weights are re-computed according to the share of each country in Vietnam trade with the group). The NEER and REER follow the same depreciation trend over 1999-2003 but they diverge since 2004. The NEER significantly depreciated between 2005 and 2013 and then slowed down until the end of 2017 by approximately 40%. Meanwhile, the REER appreciated by about 20% over 2005-2017.

Figure III.6. The NEER and REER between Vietnam and Asian countries



Source: Author's calculation, the data is from the IFS, DOTs (IMF).

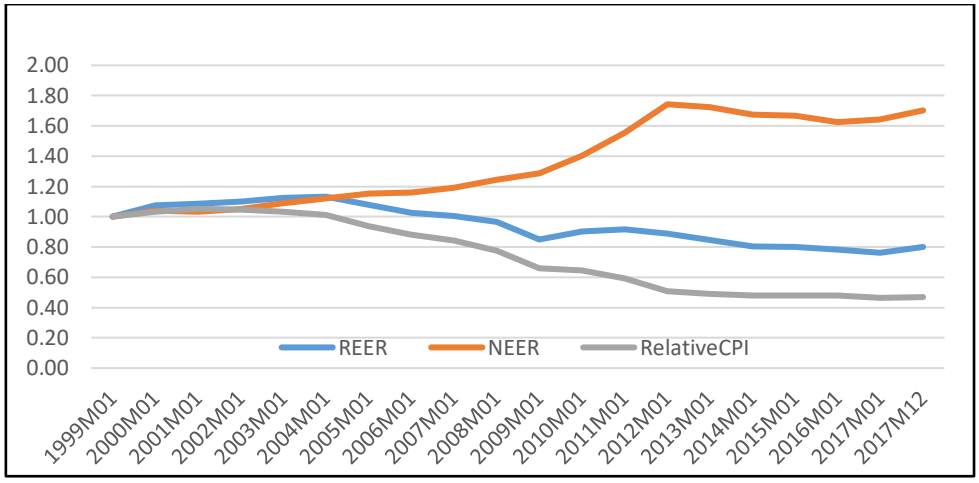
-The NEER and REER between Vietnam and 20 main trading partners,

The NEER and the REER of Vietnam against its main trading partners are displayed in Figure III.7. The NEER depreciated by 70% but the REER appreciated by 21.5% over 1999-2017. It would reveal that the State Bank of Vietnam managed the nominal exchange rate in order to improve competitiveness. However, the Vietnam CPI increased more rapidly than those of its trading partners. As shown in Figure III.7, cumulatively, the relative CPI of foreign countries to Vietnam reduced by approximately 50% from 1999 to the end of 2017 (then, inflation in Vietnam is twice higher than inflation in its trading partners). Consequently, the REER appreciated over this period, suggesting that Vietnam lost in competitiveness.

In figure III.7, the NEER and the REER depreciated over 1999-2004 thanks to a weaker inflation in Vietnam compared to its trading partners (a rise of the relative foreign CPI to domestic CPI of approximately 10%). This would result in a gain of competitiveness for Vietnam. However, since 2004 the NEER and the REER have diverged because of higher inflation in Vietnam. The relative CPI fell sharply from December 2001 to 2017.

The changes in the NEER and the REER also exhibits some breaks over 2004-2017. The NEER depreciated by 14% in 2011 compared to 2010. The NEER stabilized while the REER slowly appreciated over 2012-2017.

Figure III.7. The NEER, REER and the relative CPI, 1999-2017



Source: Author's calculation, the data is from the IFS and DOTs (IMF).

The authorities depreciated the nominal exchange rate to improve competitiveness of domestic production. However, domestic inflation accelerated causing an adverse change in the RER reducing the effectiveness of this policy. Figures III.1, III.4, III.5 reveal that the SBV seems to follow a policy that aimed to stabilize the BRER against the Chinese Yuan, particularly in the period 1999-2015.

III.2. THE PURCHASING POWER PARITY

Whether a free or a managed exchange rate could adjust towards an equilibrium level remains a key question for exchange rate policy. Countries that follow a fixed exchange rate regime need to know what is the equilibrium level of the exchange rate, meanwhile countries with floating exchange rates would need to identify expected changes in nominal and real exchange rates.

Purchasing power parity (PPP) is a classical theory explaining that the purchasing power of one unit of currency should be similar in the domestic economy and abroad: one unit of domestic currency should be able to buy the same basket of goods in two countries when it is converted into an equivalent amount of foreign currency using the exchange rate. The nominal exchange rate and the ratio of price levels between the two countries should then equalize.

Assuming that the basket of goods is composed of tradable and non-tradable goods, PPP theory may hold through international arbitrage on goods. Under the Law of One price, the price of tradable goods equalizes over the world when it is expressed in a common currency, assuming that tradable goods can easily move from one place to another with no costs. If the baskets of goods are similar across countries, the Law of One price leads the PPP to hold to the tradable good. That is the perfect case of PPP that is called the absolute PPP. However, the assumption of no transaction, transport, and tax costs is not a realistic hypothesis in international trade. When these costs exist, the nominal exchange rate may be proportional to the ratio of price levels. Therefore, conditions may exist to observe a relative PPP.

Although the PPP theory is still debated, it remains an important approach to explain changes in the exchange rates, identifying equilibrium long-run level of the exchange rate, and to compare competitiveness between countries in international trade. Therefore, the examination of the relative PPP hypothesis has received a lot of consideration. However, given short-term shocks than can affect the dynamics in the exchange rates and prices, PPP is considered as a hypothesis that would hold in the long run.

The empirical works testing the PPP hypothesis can be classified into main groups of tests (1) tests of the stationarity of the RERs (around a long-term constant); (2) the cointegration analysis on long-run relations between nominal exchange rates and relative price indices.

Tests of the stationarity of the RER present mixed results. For example, Acaravci and Ozturk (2010) examine the PPP hypothesis in 6 transition countries using monthly data over 1992–2009 by testing the stationary of the real exchange rate. The results indicate that the real effective exchange rate are non-stationary for six countries, rejecting the PPP hypothesis.

Aydin (2017), using monthly data over 1994-2017, finds the PPP hypothesis is valid for Turkey, but not for Brazil, Indonesia, India, and South Africa while Karagoz and Sarac (2016) reject RER stationarity and PPP for Turkey using monthly data over 2003-2014.

The cointegration analysis approach consists of checking the existence of a stable cointegration relation between the nominal exchange rate and price indices. For example,

Kim (1990) does not reject the PPP hypothesis for five countries including Canada, France, Italy, Japan, and the United Kingdom over 1890-1987. Baharumshah and Ariff (1997) study the PPP conditions in five Southeast Asian, Malaysia, Indonesia, Thailand, Singapore, and the Philippines, using quarterly data from 1974 to 1993. They do not find cointegration between the exchange rates and the relative prices. Kargbo (2003) examine the PPP hypothesis for 30 African countries with annual data covering 1960-1997. Black exchange rates are used as an alternative variable for official exchange rates. Applying cointegration analysis, he confirms the validity of PPP theory for these countries. Sideris (2006) uses quarterly data from 1990 to 2004 to examine the PPPs in Eastern Europe transition economies (Estonia, Latvia, Lithuania, Bulgaria, Croatia, Czech Republic, Hungary, Macedonia, Poland, Romania, Slovak Republic). He applies Johansen cointegration method and finds that the PPP hypothesis is not valid for these countries. Narayan (2010) studies the PPP hypothesis using a panel cointegration test with structural breaks for Malaysia, Thailand, India, Pakistan, Sri Lanka, and the Philippines. He finds strong evidence of cointegration relations between nominal exchange rates and relative prices for these countries. More recently, Mike and Kizilkaya (2019) review the PPP hypothesis for emerging market economies using Fourier unit root tests and Fourier cointegration analysis. They find that PPP is valid for Brazil, Colombia, India, Mexico, South Africa, Thailand, and Turkey.

The empirical tests of the PPP hypothesis for developing countries usually adopt a cointegration analysis approach using bilateral nominal exchange rates. This is the case of Lieu et al. (2010) for Central Asian countries, Arize et al. (2010) for 14 African countries, Chang and Su (2013) for East Asian countries, and Tiwari and Shahbaz (2014) for India.

Regarding Vietnam, only few empirical works have explored the PPP hypothesis. Vuong (2003) examines the PPP using monthly data over 1986-2002 on bilateral RERs applying the Johansen cointegration method. He finds that the relative PPP theory is satisfied for the bilateral RER of the VND against 4 foreign currencies (USD, GBP, EUR and JPY). However, when he examines the stationarity of the RERs using ADF and PP tests, only the RER against the USD responds to the PPP conditions. Bui et al. (2016) investigate the misalignment of the bilateral RER between VND and USD using quarterly data from 1995:1 to 2014:2. Applying the cointegration methods of Engle and Granger (1987) and

Johansen (1990), they find a significant misalignment between the actual RER and the one predicted by long-run PPP, revealing that the PPP conditions are not valid over this period.

In this study, we perform both approaches, the unit root test on RER, and the cointegration analysis between the nominal exchange rate and the relative prices to examine the PPP hypothesis in Vietnam over 1999-2017.

III.2.1. Unit root test

Examining the PPP theory can be done by testing the stationarity of RERs time series around a constant. The constant level of the exchange rate compatible with PPP is considered as its long-run equilibrium level, and any change in the RERs represents deviations from the PPP. Using series from the previous section, with the nominal exchange rate measured as the number of units of domestic currency for one unit of foreign currency, when the RER is lower (higher) than the constant PPP equilibrium level, the nominal exchange rate is overvalued (undervalued) and it would need to depreciate (appreciate). The (long-term) PPP would then hold only if misalignments are temporary, when the RER would only temporarily depart from the PPP equilibrium level (that is, is stationary around the constant).

Applying the conventional unit root analysis to examine the PPP hypothesis is a preferred approach. However, the problem of low power and size distortion in these tests are explained and summarized in Haldrup and Jansson (2006). First, Augmented Dickey-Fuller (ADF) and Philipps-Perron (PP) tests sometimes display size distortions in finite samples when errors are serially correlated, especially when errors are of the moving average type with a root approaching minus one (Schwert, 1989; Agiakloglou and Newbold, 1992). Second, the power of unit root tests decreases when the number of observations is limited (Haldrup and Jansson, 2006; and Mills, 2019[13]). In order to avoid the limitation of each method, we apply different unit root tests including the ADF, the

[13] Mills (2019), Chapter 5. Unit roots, Difference and Trend Stationary, and Fractional Differencing. in "Applied Time Series Analysis: A Practical Guide to Modelling and Forecasting", 2019, pages 71-101.

PP, and the Kwiatkowski-Phillips-Schmidt-Shin (KPSS)[14]. We perform tests to both the bilateral exchange rate against the USD and the multilateral REER, using official and black exchange rates alternatively, which are presented in section 1. Black exchange rate series have proved to support PPP more often compared to the official exchange rates in countries where a parallel foreign exchange markets exists (Kargbo, 2003; Bahmani-Oskooee and Goswami, 2006; Bahmani-Oskooee and Tanku, 2006).

III.2.1.1. Unit root and stationarity tests for bilateral RER

In the following, PPP is rejected when the presence of one unit-root or if the stationarity is rejected in the level of the RER series. The augmented Dickey-Fuller test (ADF) and the Phillips-Perron test (PP) are unit-root test (H0: the series possesses a unit root), while the KPSS is a test of stationarity (H0: the series is stationary).

First, we examine the bilateral RER of the VND against the USD. The results of unit root/stationarity tests for the RER between the VND and USD are reported in tables III.1 to III.3.

Table III.1. Bilateral RER VND/USD Augmented Dickey-Fuller unit-root tests

	Without trend				Trend			
	X		ΔX		X		ΔX	
RER (official)	0	0.14	0	-14.51***	0	-1.36	0	-14.70***
RER (black)	0	-0.07	0	-14.56***	0	-1.35	0	-14.71***

Notes:

1. The ADF tests include a constant and seasonal dummies, with or without a deterministic trend.
2. The lags length chosen according to the AIC criterion is given in parentheses.
3. The critical values used are – 3.99 (1% level) and – 3.43 (5% level) with trend or -3.45 (1% level) and -2.87 (5% level) without trend, respectively.
4. *** and ** rejection of null hypothesis of a unit root at a significance level of 1% and 5%.

[14] The ADF and PP unit root tests have the null hypothesis I(1) while the KPSS unit root test is based on the null hypothesis I(0). Consequently, the KPSS unit root tests only choose one or more differences when it has evidence to overturn the stationary assumption, while the ADF and PP tests select at least one difference unless there is enough evidence to overturn the non-stationary assumption, for more detail in Zigot and Wang (2006).

Table III.2. Bilateral RER VND/USD Phillips-Perron unit root tests

	Without trend		Trend	
	X	ΔX	X	ΔX
RER (official)	-0.09	-14.54	-1.39	-14.69
RER (black)	-0.23	-14.53	-1.40	14.71

Note:
1. The Phillips-Perron tests include a constant, with or without a deterministic trend.
2. Test critical values: 1% level is -3.45; 5% level is -2.87 without trend
3. Test critical values (trend): 1% level is -3.99; 5% level is -3.42.

Table III.3. Bilateral RER VND/USD KPSS stationarity tests

	Without trend		Trend	
	X	ΔX	X	ΔX
RER (official)	1.11	0.51	0.38	0.21
RER (black)	1.04	0.44	0.39	0.16

Note:
1. The KPSS tests include a constant, with or without a deterministic trend.
2. Asymptotic critical values (without trend): 1% level is 0.74; 5% level is 0.46; 10% level is 0.34.
3. Asymptotic critical values (trend): 1% level is 0.21; 5% level is 0.14; 10% level is 0.11.

All tests show that the RERs are not stationary for both the official RER and the black RER, implying that the PPP can be rejected. The RER is not stationary around a constant so that changes in the nominal exchange rate and changes in the relative price index are not proportional.

Second, we also study the bilateral RER of the VND against the Chinese Yuan (CNY). The results are presented in the tables below.

Table III.4. Bilateral RER VND/CNY ADF unit root tests

	Without trend				Trend			
	X		ΔX		X		ΔX	
RER(office)	0	-1.51	0	-15.1**	0	-2.88	0	-15.1**
RER(black)	0	-1.87	0	-13.6**	0	-2.84	0	-13.6**

Notes:
1. The ADF tests include a constant and seasonal dummies, with or without a deterministic trend.
2. The lags length chosen according to the AIC criterion is given in parentheses.
3. The critical values used are – 3.99 (1% level) and – 3.43 (5% level) with trend or -3.45 (1% level) and -2.87 (5% level) without trend, respectively.
4. *** and ** rejection of null hypothesis of a unit root at a significance level of 1% and 5%.

Table III.5. Bilateral RER VND/CNY Phillips-Perron unit-root tests

	Without trend		Trend	
	X	ΔX	X	ΔX
RER(office)	-1.51	-15.12 **	-2.90	-15.13**
RER(black)	-2.00	-13.57 **	-2.97	-13.63**

Note:
1. The Phillips-Perron tests include a constant, with or without a deterministic trend.
2. Test critical values: 1% level is -3.45; 5% level is -2.87 without trend
3. Test critical values (trend): 1% level is -3.99; 5% level is -3.42.

Table III.6. Bilateral RER VND/CNY KPSS stationarity tests

	Without trend		Trend	
	X	ΔX	X	ΔX
RER(office)	1.17	0.09	0.09	0.05
RER(black)	0.83	0.08	0.11	0.03

Note:
1. The KPSS tests include a constant, with or without a deterministic trend.
2. Asymptotic critical values (without trend): 1% level is 0.74; 5% level is 0.46; 10% level is 0.34.
3. Asymptotic critical values (trend): 1% level is 0.21; 5% level is 0.14; 10% level is 0.11.

The results of the tests show that the bilateral exchange rates of the VND against the Chinese Yuan are non-stationary for both series of the official and black exchange rates over the studied period. However, the results of KPSS tests indicate the bilateral exchange rates are only stationary at I (2) with a deterministic trend in the models.

III.2.1.2. Unit root tests for multilateral REER

In this section, we examine the PPP hypothesis for the multilateral REER of the VND against a basket of currencies. The results of unit root and stationarity tests for the REER are reported in tables III.7 to III.9.

Table III.7.. REER Augmented Dickey-Fuller unit root tests

	Without trend				Trend			
	X		ΔX		X		ΔX	
REER (office)	0	0.04	0	-13.92***	0	-2.97	0	-14.04***
REER (black)	0	-0.12	0	-13.05***	0	-2.98	0	-13.15***

Notes:
1. The ADF tests include a constant and seasonal dummies, with or without a deterministic trend.
2. The lags length chosen according to the AIC criterion is given in parentheses.
3. The critical values used are – 3.99 (1% level) and – 3.43 (5% level) with trend or -3.45 (1% level) and -2.87 (5% level) without trend, respectively.
4. *** and ** rejection of null hypothesis of a unit root at a significance level of 1% and 5%.

Table III.8. REER Phillips-Perron unit root tests

	Without trend		Trend	
	X	ΔX	X	ΔX
REER (office)	-0.04	-13.91	-2.98	-14.03
REER (black)	-0.23	-13.03	-3.03	-13.15

Notes:
1. The Phillips-Perron tests include a constant, with or without a deterministic trend.
2. Critical value without trend at 1% level = -3.45 and at 5% level = -2.87.
3. Critical value including a determined trend at 1% level = -3.99 and at 5% level = -3.42.

Table III.9. REER KPSS stationarity tests

	Without trend		Trend	
	X	ΔX	X	ΔX
REER (office)	1.75	0.28	0.18	0.13
REER (black)	1.70	0.23	0.23	0.08

Note:
1. The KPSS tests include a constant, with or without a deterministic trend.
2. Critical values (without trend) at 1% level = 0.74; at 5% level = 0.46; at 10% level = 0.34.
3. Critical values (trend): at 1% level = 0.21; at 5% level = 0.14; at 10% level = 0.11.

The results of all tests indicate that the REERs are non-stationary, rejecting PPP. Changes in the nominal effective exchange rate and changes in the relative price level of Vietnam against its partners are not proportional.

III.2.2. Cointegration analysis approach

In the cointegration approach, the hypothesis is that the PPP is valid only when a long-run relation exists between the nominal exchange rate and the relative price indices.

The equation for the test of the long-run PPP relationship is often expressed as,

$$e_t = \alpha + \beta_1 p_t - \beta_2 p_t^* + \varepsilon_t \qquad (15)$$

where e_t is the logarithm of the nominal exchange rate, p_t and p_t^* are logarithms of domestic and foreign price indices, and ε_t is an error term. From the equation (15), two versions of the PPP could be tested, the absolute PPP and the relative PPP.

The absolute PPP (strong PPP) requires a tight ratio between the exchange rate and the price indices ($\beta_1=\beta_2=1$), so that the equation (15) would become:

$$e_t = \alpha + p_t - p_t^* + \varepsilon_t \qquad (16)$$

The relative PPP (weak PPP) is a loose version of the PPP with a less restricted requirement that $\beta_1=\beta_2$. The equation (15) would then become:

$$e_t = \alpha + \beta_1 (p_t - p_t^*) + \varepsilon_t \qquad (17)$$

In the following, we then test for a long-run relationship between e, p, and p* but also for β_1 and β_2 equality.

We apply the Johansen (1995)'s test based on the VECM that is expressed as follows.

$$\Delta Y_t = \alpha\beta' Y_{t-k} + \sum \Gamma_t \Delta Y_{t-i} + D_t + \varepsilon_t \qquad (18)$$

where Y_t is the vector of variables, β' denotes the matrix of parameters of co-integrating vectors, $\beta' Y_{t-k}$ are long-run relationships, α is the matrix of the parameters of equilibrium-correction, Γ_t is the matrix of short-run parameters, D_t denotes deterministic components (constants, centered seasonal dummies, and trends) and ε_t is the vector of error-terms.

We test the PPP long run relationship using time series on nominal exchange rates and foreign prices from the bilateral RER and multilateral REER presented above. First we test the order of integration of the nominal exchange rates and of the domestic and foreign prices and second we analyze cointegration between those variables.

III.2.2.1. Cointegration analysis for the bilateral RER

The equation (15) can be expressed as follows,

$$\text{Log}(E)_t = a + b\ \text{Log}(CPI)_t - c\ \text{Log}(CPI^*)_t + e_t \qquad (19)$$

where E is the nominal exchange rate measured as numbers of VND per one US dollar. The CPI and CPI* are the consumer price indices of Vietnam and of the United States respectively.

The tables (III.10) and (III.11) present the results of the ADF and Phillips-Perron unit root tests that show that the variables are non-stationary and integrated at the first order I (1), allowing a cointegration relation to exist among them.

Table III.10. ADF unit root tests

Variables	Trend				Without trend			
	X		ΔX		X		ΔX	
Log(E)	(0)	-1.57	(0)	- 16.64***	(0)	-1.26	(5)	- 16.62***
Log(CPI)	(13)	-2.04	(12)	- 3.55**	(13)	0.21	(12)	- 3.49***
Log(CPI*)	(2)	-1.65	(1)	-10.85***	(2)	-1.36	(1)	-10.78***

Notes:

1. The ADF tests include a constant and seasonal dummies, with or without a deterministic trend.
2. The lags length chosen according to the AIC criterion is given in parentheses.
3. The critical values used are – 3.99 (1% level) and – 3.43 (5% level) with trend or -3.45 (1% level) and -2.87 (5% level) without trend, respectively.
4. *** and ** rejection of null hypothesis of a unit root at a significance level of 1% and 5%.

Table III.11. Phillips-Perron unit root tests

Variables	Trend		Without trend	
	X	ΔX	X	ΔX
Log(E)	-1.56	-16.65**	-1.27	-16.62**
Log(CPI)	-1.35	-10.42**	0.14	-10.46**
Log(CPI*)	-0.97	-8.67**	-1.82	-8.60**

Notes:

1. The Phillips-Perron tests include a constant, with or without a deterministic trend.
2. Critical value without trend at 1% level = -3.45 and at 5% level = -2.87.
3. Critical value including a determined trend at 1% level = -3.99 and at 5% level = -3.42.
4. ** and * rejection of null hypothesis of a unit root at a significance level of 1% and 5%.

We now turn to the cointegration analysis on the vector log(E), log(CPI), log(CPI*). We include seasonal dummies into the VECM. The lag length of 6 months is adopted to eliminate residuals autocorrelation. We follow previous studies in choosing the specification with an unrestricted constant in the VAR, and a restricted constant but without a deterministic trend in the cointegrating space. The results have a poor economic sense (results are available on request). Therefore, we add a deterministic trend in the cointegration vector. The results are reported in table III.12. The trace tests confirm the existence of a cointegrating vector implying a long-run relationship between the nominal exchange rate and the two price indices. Unrestricted adjustment coefficients and standardized eigenvectors show that the parameters of the cointegrating vector have economic and statistical significance. The parameter of the domestic price index is negative, and the one of foreign price index is positive.

Table III.12. VECM residuals diagnostic statistics (6 lags)

VECM residuals diagnostic statistics

	AR(1)	***AR(3)***	***JB***	***ARCH***	***H***
Y	1.08 [0.37]	1.11 [0.31]	1573.8 [0.00]		1.30 [0.00]
Log(E)	1.18 [0.26]	0.74 [0.52]	1571.8 [0.00]	0.03 [0.85]	1.10 [0.32]
Log(CPI)	0.42[0.51]	1.32 [0.26]	1.51 [0.46]	0.55 [0.45]	2.18 [0.00]
Log(CPI^*)	2.19 [0.14]	1.60 [0.18]	1.85 [0.39]	9.65 [0.00]	1.22 [0.17]

Reduced rank statistic

Eigenvalues	***H0: rank ≤***	***Trace test***
	0	67.84 [0.00]**
0.188	1	21.51 [0.16]
0.067	2	5.989 [0.47]
0.026	3	

Adjustment coefficients and standardized eigenvectors (scale on diagonal)

α	***α1***	***α2***	***α3***
Log(E)	-0.01	-0.001	0.01
Log(CPI)	0.001	-0.019	-0.001
Log(CPI^*)	-0.01	-0.002	-0.002

B	***β1***	***β2***	***β3***
Log(En)	1	-0.66	-3.56
Log(CPI)	-0.59	1	1.40
Log(CPI^*)	7.10	-4.41	1
Trend	-0.01	0.002	-0.002
Constant	-38.4	21.97	24.3

Adjustment coefficients and restricted eigenvectors: β(CPI)=-1; β(CPI) =1.*

LR test of restrictions: $\chi 2(2) = 14.90$ [0.00]**

A	***α1***
Log(E)	-0.001

β	***β1***
Log(En)	1

Log(CPI)	-0.001
Log(CPI*)	-0.001

Log(CPI)	-1
Log(CPI*)	1
Trend	0.01
Constant	-13.8

We test the hypothesis of the absolute PPP. The results display that the absolute PPP is rejected.

III.2.2.2. Cointegration analysis for the REER

The equation (15) can be expressed as a form,

$$Log(NEER)_t = \alpha + \beta_1 * log(P) - \beta_2 * log(P^*)_t + u_t \quad (20)$$

where NEER is the nominal effective exchange rate $\prod_{i=1}^{n} \left\{E_{VNDi}\right\}^{\omega i}$, and $P=\prod_{i=1}^{n} (CPI_{vn})^{\omega i}$ and $P^*=\prod_{i=1}^{n} (CPI^*)^{\omega i}$. The hypothesis of the strong PPP requires $\beta_1=\beta_2=1$ and the relative PPP involves $\beta_1 = \beta_2$ in the equation (20).

Tables III.13 and III.14 report the results of unit root tests. The variables are non-stationary at level but stationary at the first-order I (1) that allows the existence of one cointegrating vector among them.

Table III.13. ADF unit root tests

Variables	Trend				Without trend			
	X		ΔX		X		ΔX	
Log(NEER)	(6)	-1.69	(5)	- 4.47**	(6)	-0.64	(5)	- 4.48**
Log(P)	(1)	-2.59	(0)	- 6.50**	(1)	0.01	(0)	- 6.52**
Log(P*)	(3)	-2.02	(2)	-9.13**	(3)	-0.10	(2)	-9.16**

Notes:

1. The ADF tests include a constant and seasonal dummies, with or not a deterministic trend.
2. The lags length chosen according to the AIC criterion is given in parentheses.
3. The critical values used are – 3.99 (1% level) and – 3.43 (5% level) with trend or -3.45 (1% level) and -2.87 (5% level) without trend, respectively.
4. *** and ** rejection of null hypothesis of a unit root at a significance level of 1% and 5%.

Table III.14. Phillips-Perron unit root tests

Variables	Trend		Without trend	
	X	ΔX	X	ΔX
Log(NEER)	-1.33	-15.98**	-0.57	-16.01**
Log(P)	-2.14	-8.43**	0.28	-8.36**
Log(P*)	-3.36	-23.38**	0.03	-23.4**

Notes:
1. The Phillips-Perron tests include a constant, with or without a deterministic trend.
2. Critical value without trend at 1% level = -3.45 and at 5% level = -2.87.
3. Critical value including a determined trend at 1% level = -3.99 and at 5% level = -3.42.
4. ** and * rejection of null hypothesis of a unit root at a significance level of 1% and 5%.

Turning to the cointegration analysis, seasonal dummies are added to the VECM and we impose a trend and a restricted constant in the cointegrating vector and an unrestricted constant in the VAR. A lag lengths are 6 are imposed to eliminate miss-specifications. The results are reported in table III.15.

Table III.15. VECM residuals diagnostic statistics (6 lags)

VECM residuals diagnostic statistics

	AR(1)	***AR(6)***	***JB***	***ARCH***	***H***
Y	1.77 [0.07]	1.21 [0.15]	267 [0.00]		1.36 [0.01]
Log(NEER)	8.30 [0.01]	2.01 [0.05]	195 [0.00]	2.20 [0.05]	1.21 [0.18]
Log(P)	4.88[0.03]	2.87 [0.01]	24 [0.00]	0.89 [0.49]	1.42 [0.05]
Log(P*)	1.20 [0.27]	0.62 [0.81]	12.8 [0.01]	1.38 [0.22]	1.69 [0.01]

Reduced rank statistic

Eigenvalues	***H0: rank ≤***	***Trace test***
	0	74.7 [0.00]**
0.206	1	23.2 [0.102]

0.055	2	10.57 [0.104]
0.046	3	

Adjustment coefficients and standardized eigenvectors (scale on diagonal)

α	***α1***	***α2***	***α3***
Log(NEER)	0.001	0.02	-0.03
Log(P)	-0.001	0.01	0.002
Log(P*)	-0.003	0.07	-0.002

B	***β1***	***β2***	***β3***
Log(NEER)	1	0.88	0.29
Log(P)	-22	1	-0.42
Log(P*)	164	-10.3	1
Trend	-0.18	0.01	0.007
Constant	-659	38.7	-4.03

Adjustment coefficients and restricted eigenvectors: β(CPI)=-1; β(CPI) =1.*

LR test of restrictions: $\chi 2(2) = 25.94$ [0.00]**

A	***α1***
Log(E)	-0.001
Log(CPI)	-0.001
Log(CPI*)	-0.001

β	***β1***
Log(En)	1
Log(CPI)	-1
Log(CPI*)	1
Trend	0.002
Constant	-7.18

The tests reject the equality of the estimated parameters for log(CPI) and log(CPI*) and then the hypothesis of PPP

All results for both of the RER and the REER imply that the PPP hypothesis is invalid in the case of Vietnam in the study period. They indicate that changes in the nominal exchange rate are not proportional to changes in the relative price levels. Since the RERs departs from the PPP equilibrium level significantly, it would be then affected by other factors, which is now explored in the next section.

III.3. RER DISEQUILIBRIUM AND MISALIGNMENT

Having rejected the PPP conditions in the previous section, we now examine the long-run changes in the REER and whether they can be caused by changes in the long run fundamentals of the Vietnam economy. We use annual data of the REER because of a lack of quarterly and monthly series of the fundamentals. The study covers the 1990-2016 period.

III.3.1. The real effective exchange rate: Measure and statistical properties.

We use the external RER measure since the neither internal measure is not available nor computable for a long period for Vietnam.

The real effective exchange rate (REER) is measured as a weighted geometric mean of the bilateral RER between Vietnam and 10 main trading partners. The series of the REER in this section come from a database produced by the CERDI[15].

$$\text{REER} = \prod_{j=1}^{10}\left(E_{j/VND} * \frac{CPI_{VN}}{CPI_j}\right)^{\omega_j} \qquad \text{and} \sum_{j=1}^{10}\omega_j = 1 \qquad (22)$$

The series of $E_{j/VND,}$ $CPI_{VN,}$ CPI_j and then the REER index are based 100 in 2010. Contrasting with monthly series used in the previous section, here an increase is an appreciation of the REER, which would be caused by an appreciation of (increase in) the nominal exchange rate E or an increase in the relative prices in Vietnam compared to partner countries.

$E_{j/VND}$ represents the nominal bilateral exchange rate between the Vietnam dong and the partner j's currency. It is measured as the number of units of foreign currency per one unit of Vietnam currency (crossing the nominal exchange rates against the US dollar: $Ej_{/VND} = Ej_{/USD} / E_{VND/USD}$). The series of $Ej_{/USD}$ and $E_{VND/USD}$ are collected from the International Financial Statistic (IFS-IMF).

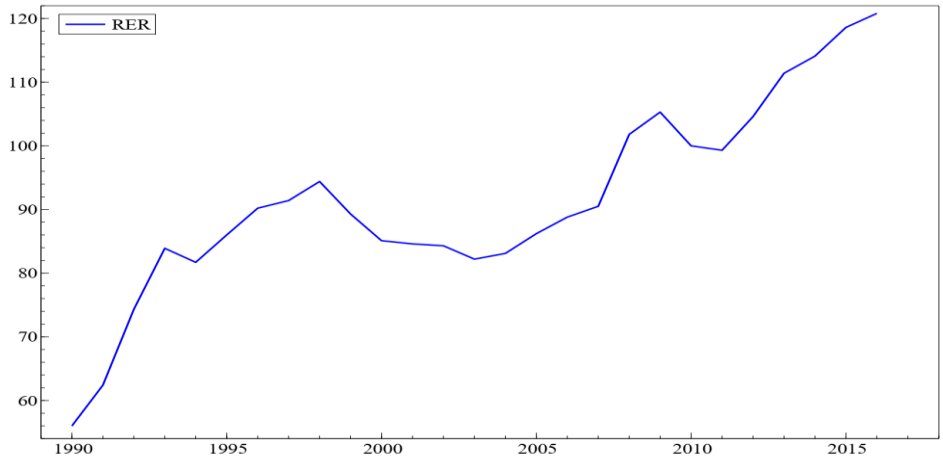
CPI_{VN} is the consumer price index in Vietnam, and CPI_j is the CPI of partner country j. These series are extracted from the IFS (IMF). The CPIs are typically employed in studies on developing countries since they are the only available ones.

[15] We thank Martine Bouchut for the production and access to these series.

ω_j represents the weight of the trading partner j in the total trade volume of Vietnam with the 10 main partners (export + import) over the period 1990-2016. Data on export and import values were collected from the Direction of Trade Statistics (DOTs-IMF).

Therefore, the series indicate an increase or an appreciation of the REER in Figure III.8. The REER sharply appreciates over 1990-1998 and 2007-2016, generated by the managed - fixed exchange rate regime and a higher inflation rate in Vietnam compared to trading partners in these periods. The REER is more stable over 1998-2007 when domestic prices stabilize.

Figure III.8. The REER over 1990-2016



Source: CERDI. *Note:* an increase is an appreciation.

We demonstrated in the previous section using monthly series that the REER was not stationary in level, rejecting PPP over the period 1999-2017. As the Figure III.8 shows, the REER based on annual data is also far to converge around a constant in the long run. The REER could then be stationary around a changing long-run equilibrium level of the REER, determined by changing fundamental conditions in the economy.

The REER could then be stationary around a deterministic trend. In order to examine this hypothesis, we check the statistical properties of the REER using the ADF tests.

Table III.16: ADF tests of REER in the period 1990-2016

Without trend				With trend			
LREER		ΔLREER		LREER		ΔLREER	
ADF	Lag	ADF	Lag	ADF	Lag	ADF	Lag
0.15	1	-4.25**	0	-1.45	1	-4.81**	0

Notes:
1. The ADF tests include a constant, with or without a deterministic trend.
2. The lags length chosen according to the AIC criterion.
3. The critical values used are – 4.42 (1% level) and – 3.62 (5% level) with trend or -3.75 (1% level) and -3.00 (5% level) without trend, respectively.
4. *** and ** rejection of null hypothesis of a unit root at a significance level of 1% and 5%.

The table III.16 presents the results of ADF tests. It shows he REER is not stationary in level and around a trend.

As an intermediary conclusion, the PPP is rejected for Vietnamese economy over a long period 1990-2016, since the RER is found to be non-stationary, and, moreover, the RER is also not stationary at level with a deterministic trend. Consequently, we now explore the hypothesis that the REER would converge towards an equilibrium value, which would be neither a constant nor a deterministic trend, but would be function of some fundamental factors.

III.3.2. The relation between REER and fundamental factors

The conventional approach to investigate the long-run RER is usually based on the model of a small dependent economy developed by Salter (1959) and Swan (1960), which was renewed by Devarajan and De Melo (1987), Agenor and Montiel (1995), and Hinkle and Montiel (1999). The model assumes that there are two types of goods sectors in the domestic economy, the tradable goods that are influenced by international competition and the non-tradable goods that are isolated. The relationship between the two sectors is determined by the relative prices of tradable and non-tradable goods, the so-called RER.

The observed RER is supposed to fluctuate around a long-run equilibrium level that ensures that the economy reaches internal and external balances. The conditions for internal and external balances, and then the equilibrium RER vary according to changes in fundamental factors of the economy. Empirical works on the long-run relationship

between the RER and its fundamentals in developing countries usually follow the approach of the Behavioral Equilibrium Exchange Rate of Clark and MacDonald (1998), preferred to the approach of the Fundamental Equilibrium Exchange Rate from Williamson (1994), or the approaches of Natural RER from Stein (1994) and Stein and Allen (1997).

III.3.2.1. The fundamental factors

Following the literature, candidate variables that can proxy fundamental factors include the productivity differentials (or the Balassa-Samuelson effect), the terms of trade, trade openness, interest rate differentials, fiscal policy, etc. The choice of fundamental variables may vary from one study to another (Edward, 1988, 1994; Froot and Rogoff, 1995; Rogoff, 1996; Hinkle and Montiel, 1999; Baffes et al, 1999; MacDonald and Ricci, 2003; Koranchelian, 2005; Chinn, 2005; Zalduendo, 2006; Diop et al, 2018…).

- The productivity differentials vis –a – vis trading partners,

The productivity differentials vis–a–vis trading partners is often used to proxy the so-called Balassa-Samuelson effect. It explains that a rise of the productivity in the tradable goods sector, which is expected in a developing country like Vietnam, leads to higher wages in this sector, and if the labor can move freely between sectors, then higher wages in tradable goods sector transfer into higher wages in the non-tradable goods sector. If the productivity growth in the non-tradable goods sector is slower, the price of non-tradable goods will increase and ultimately leads to an appreciation of the RER (Balassa, 1964; and Samuelson, 1964).

The Balassa Samuelson effect – relative productivity variable for Vietnam is measured as follows,

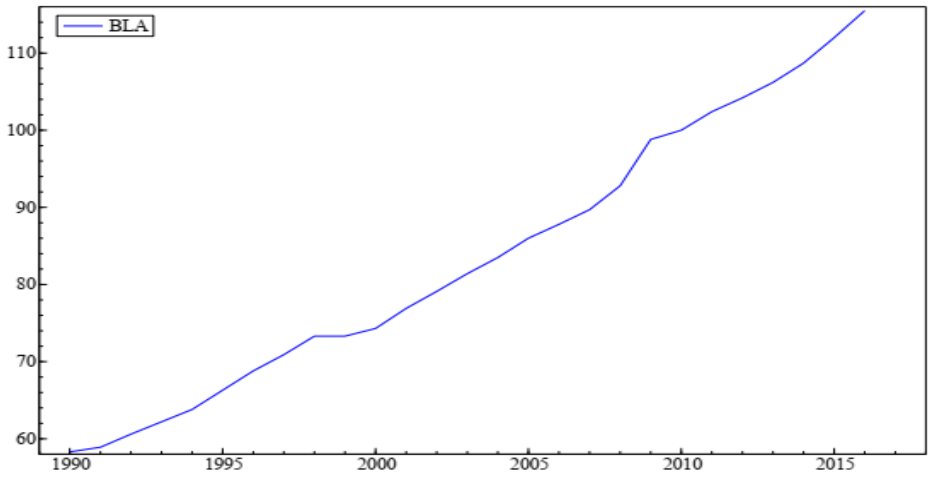
$$\text{BLAS} = \prod_{j=1}^{10} \left(\frac{\text{GDP}_{\text{PCj}}}{\text{GDP}_{\text{PC}}}\right)^{\omega_j} \qquad \text{and} \quad \sum_{j=1}^{10} \omega_j = 1 \qquad (23)$$

where ω_j are the weights used in the computation of the REER (ωj is the share of the trading partner j in the total trade volume of Vietnam with the 10 main partners). GDPpc and GDPpc_j are the gross domestic products per capita of Vietnam and of the partner country j at constant price 2010 in dollars. The data for measuring of the Balassa-

Samuelson effect is computed by the CERDI (Centre d'Etudes et de Recherches sur le Developpement International) using the databases BACI 2016 (CEPII, Centre d'études prospectives et d'informations internationales), IFS (IMF, International Monetary Fund) and WDI (WB, World Bank).

The relative productivity variable (BLAS) is reported in Figure III.9. It increases over time and seems to fluctuate around a deterministic trend. The BLAS displays two minor breaks in 1997 (Asian crisis), and 2008 (World crisis).

Figure III.9. Relative productivity of Vietnam over 1990-2016.



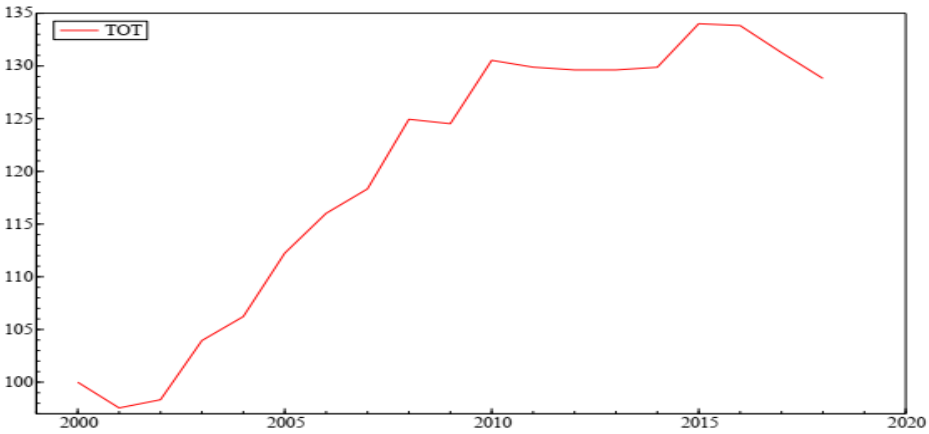
Source: CERDI – Universite Clermont Auvergne.

- Terms of trade,

The theory states that an improvement in the terms of trade increases the national revenue, raising the demand for goods and prices in the economy (income effect). While the price of tradable goods is exogenous because it is determined by world price for a small economy, an increase in the price of non-tradable goods causes an appreciation of the REER. However, if the increase in the terms of trade comes from a decrease in the price of imported goods, the demand for imported goods may increase and the demand and the price for non-tradable goods may decrease, causing a depreciation of the REER (substitution effect). The aggregated effect of an increase of the terms of trade on the REER is then ambiguous. However, in the case of a rise in the price of export goods, the consequence is unambiguously an appreciation in the REER.

Finding long-term data for terms of trade is often challenging. In the case of Vietnam, data are only available for the period 2000-2016 from the WDI-World Bank. This is why we will not use this variable in the following.

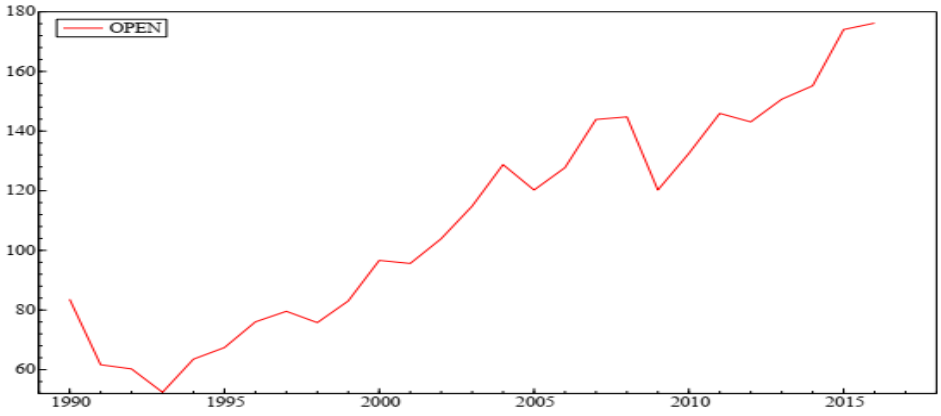
Figure III.10. Terms of trade of Vietnam, 2000-2018



Source: The World Bank.

- Trade liberalization that Vietnam engaged during the transition towards a market economy may increase the demand for tradable goods and therefore lead to a depreciation of the REER. Trade liberalization is proxied by trade openness or the ratio of total trade values (exports + imports) divided by the nominal gross domestic product. The data of nominal gross domestic products are collected from IFS (IMF). The value of export and import are extracted from DOTS (IMF).

Figure III.11. The trade openness in Vietnam 1990-2016



Source: IMF and author's calculation.

- Government expenditure can be considered as a fundamental variable if it is considered as exogenous vis-a-vis the REER (contrasting with the private sector expenditures). This

hypothesis can be explored for Vietnam since public sector activities are important for the whole economy. If the government expenditure is relatively more intensive in non-tradable goods, an increase in expenditure tends to raise the price of non-tradable goods and appreciate the REER. The government expenditure is measured as a percentage of total government spending divided by the nominal gross domestic product. The data of government expenditure and the gross domestic products are collected from IFS (IMF). In Figure 12, it is interesting to see that, after a stabilization policy at the beginning of the 1990s signaled by a declining ratio, the weight of the public expenditures in GDP increase since the end of the 1990s, and stabilize at around 28-30% of GDP since 2006. It is then expected that public expenditures can play an important role as a fundamental for the Vietnam economy and the RER.

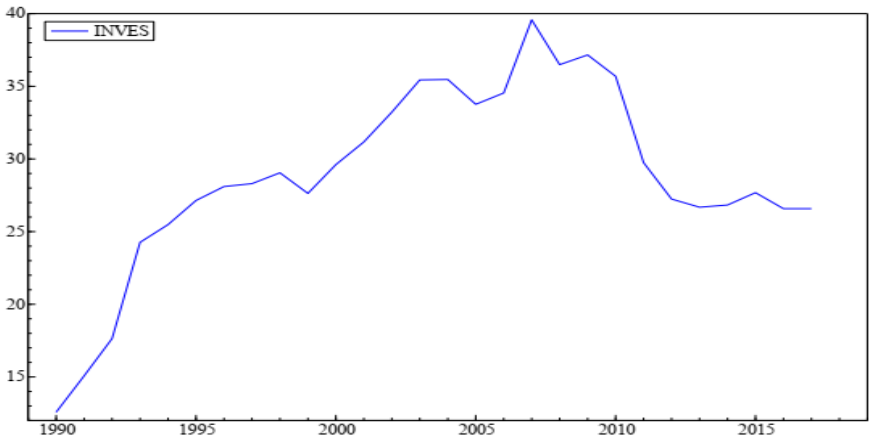
Figure III.12. The government expenditure, 1990-2016

Source: IMF and author's calculation.

- The investment rate is measured as the investment by the whole economy, as a ratio of GDP. It is sometimes utilized as a candidate variable to estimate the long run REER; see for example Diop et al. (2018) for Senegal, Doroodian (2002) for Turkey.

The figure III.13 shows the investment increased in the beginning of the 1990s and over 2006-2008. However, it fells sharply after 2010.

Figure III.13. The investment rate, 1990-2016.



Source: The World Bank.

III.3.2.2. The relation between REER and fundamental factors: a cointegration analysis

In this section, we investigate the long-run equilibrium level and the misalignment of the RERs using annual data on the REER and on fundamental factors from 1990 to 2016.

Bui et al. (2017) have evaluated the misalignment of the RER in Vietnam over 1995-2014 based on some fundamentals such as terms of trade, trade openness, net foreign asset, and money supply. However, they disregard one of the most important factors in the determinant of the RER, the productivity differential, which, as explained above, should play a major role for the case of Vietnam.

Empirical works on the long-run relationship between the real exchange rate and its fundamentals usually follow the approach of the Behavioral Equilibrium Exchange Rate of Clark and MacDonald (1998).

Following the BEER approach, the REER equation is expressed as follows,

$$REER_t = F(X_t) + \varepsilon_t \qquad (25)$$

where REER is the real effective exchange rate, and X represents a vector of fundamental factors. The REER level that is predicted from (25) is considered as a measure of the long-run equilibrium level of the RER. Here, the vector X consists of the Balassa-Samuelsson effect, trade openness, and government expenditure.

Therefore, following a log-linear specification, the model (25) can be expressed as:

$$LREER_t = \beta1*LBLAS_t + \beta2*LOPEN_t + \beta3*LEXPEN + \varepsilon_t \quad (26)$$

where $LREER_t$ is the logarithm of the real effective exchange rate, $BLAS_t$ is the logarithm of relative GDPpc, LOPEN is the logarithm of trade openness, LEXPEN is the logarithm of government expenditure, and ε_t is the error term.

Following a conventional Johansen (1995)'s cointegration analysis, unit root tests are first performed to examine the characteristics of the variables. Applying the Augmented Dickey-Fuller and Phillips-Perron unit root tests, the results are presented in tables III.17 and 18. The three variables are non-stationary in levels and integrated at the first order I (1). It implies that a cointegration relationship can exist between the variables.

Table III.17. The ADF unit root tests.

Variables	With trend				Without trend			
	X		ΔX		X		ΔX	
LREER	(4)	-1.53	(1)	-3.76*	(1)	-0.12	(1)	3.20*
LBLAS	(1)	-2.81	(0)	-4.10*	(4)	-0.014	(0)	-4.17**
LOPEN	(0)	-2.29	(0)	-4.85**	(2)	-1.77	(0)	-4.91**
LEXPEN	(0)	-2.60	(0)	-6.11**	(0)	-1.67	(0)	-6.24**

Notes:

1. The ADF tests include a constant, with or without a deterministic trend.
2. The lags length chosen according to the AIC criterion is given in parentheses.
3. The critical values used are – 3.66 and – 3.02 with or without trend at 5% critical values, respectively.
4. ** and * Rejection of null hypothesis of a unit root at a significance level of 1% and 5%.

Table III.18. The Phillips-Perron unit root tests

Variables	With trend				Without trend			
	X		ΔX		X		ΔX	
LREER	(1)	-2.227	(4)	-3.115	(2)	- 1.488	(7)	-3.220
LBLAS	(1)	-1.516	(3)	-4.69	(1)	2.57	(2)	-4.146

LOPEN	(2)	-4.28	(4)	-13.09	(0)	-0.16	(4)	-14.10
LEXPEN	(0)	-2.92	(4)	6.52	(3)	-1.85	(4)	6.62

Notes:

1. The Phillips-Perron tests include a constant, with or without a deterministic trend.
2. Bandwidth chosen according to Newey-West Bandwidth is given in parentheses.
3. Critical value without trend at 1% level = -3.711 and at 5% level = -2.981; with a determined trend at 1% level = -4.356 and at 5% level = -3.595.

Second, we estimate a VECM for the vector Y.

$$\Delta Y_t = \alpha\beta' Y_{t-k} + \sum \Gamma_t \Delta Y_{t-i} + D_t + \varepsilon_t \qquad (27)$$

where Y_t = [$LREER_t$, $LBLAS_t$, $LOPEN_t$, $LEXPEN_t$], β' denotes the matrix of parameters of co-integrating vectors, $\beta' Y_{t-k}$ are long-run relationships, α is the matrix of the parameters of equilibrium-correction, Γ_t is the matrix of short-run parameters, D_t denotes deterministic components (constants, dummies, and trends) and ε_t is the vector of error-terms.

Figure III.14. The graphics of LREER, LBLAS and LOPEN, LEXPEN

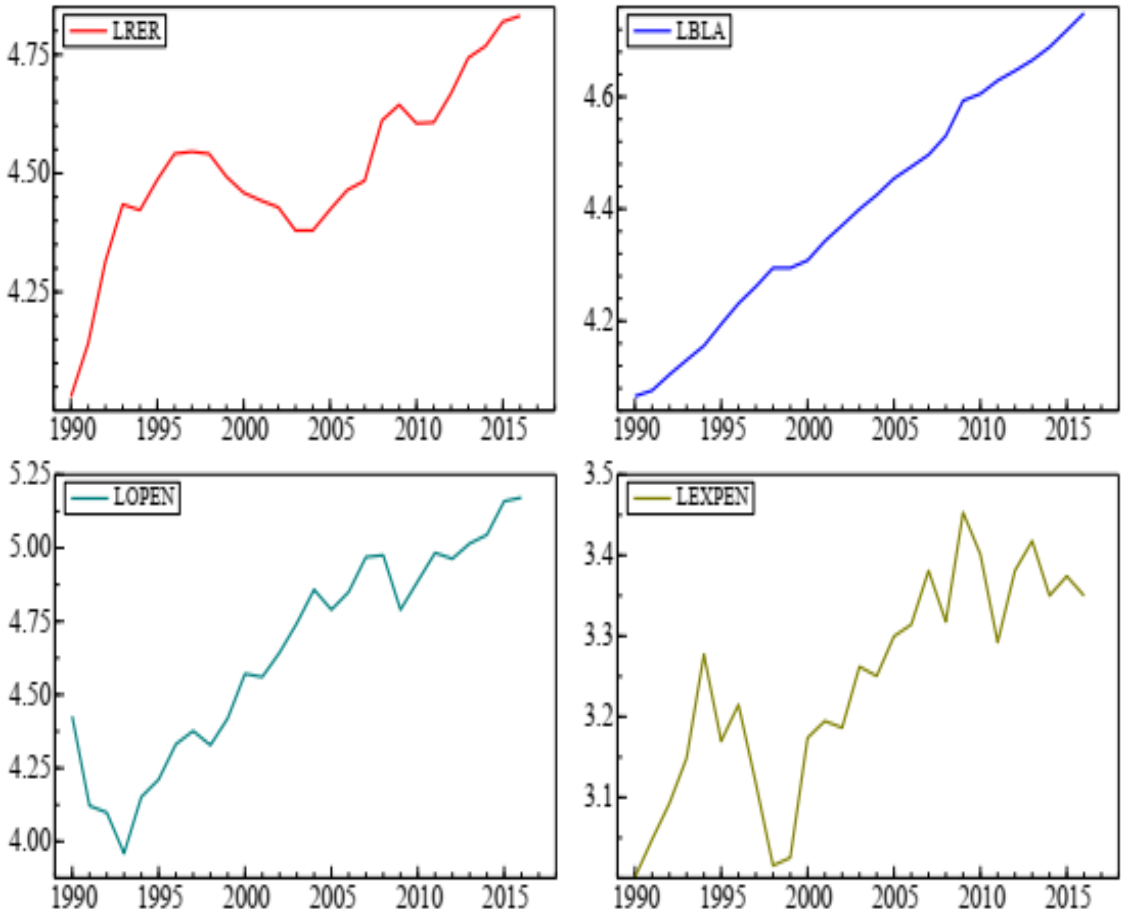


Figure III.14 shows that the REER raises (appreciates) significantly over 1990-1997 and 2004-2014, but depreciate over 1998-2003. The Balassa-Samuelson effect – relative productivity increases trendily and rapidly over the period. It indicates that a deterministic trend could be added to the model. The trade openness also raises rapidly over the period after an initial decrease. Interestingly, the government expenditure shows similar trends that the REER. Figure III.14 also displays two possible breaks in the series of LREER, LOPEN, and LEXPEN in the year of 1994 and 2008. Therefore, two dummy variables are generated and included into the vector to avoid misspecificied residuals (D1 that equals 1 in 1994 and 0 elsewhere; and D2 that equals 1 in 2008 and 0 elsewhere).

We follow previous studies in selecting the specification with a restricted constant in the cointegrating vector and an unrestricted constant in the VAR. Moreover, including a deterministic trend in the cointegrating space, while not greatly improving the overall specification, give implausible preliminary results with poor economic sense or misspecified residuals (results are reported in appendix B). A lag length k = 3 for variables of the vector Y are imposed that renders ε_t approximately Gaussian. However, the variable of government expenditure is weakly significant and the estimated impact does not have economic sense.

We then exclude the government expenditure variable to proceed with the model Y [LREER, LBLA, LOPEN]. The results are reported in table III.19. The trace tests confirm the existence of one cointegrating vector or a long-run relationship between the variables. Unrestricted adjustment coefficients and standardized eigenvectors show that the parameters of the cointegrating vector are statistically significant and have economic senses. The adjustment parameters vector $\alpha 1$ shows that LBLAS and LOPEN should be considered as weakly exogenous vis-à-vis the first cointegrating vector $\beta 1$.

Table III.19. VECM of vector Y (including 2 dummy variables D1 and D2)

III.19.1. VECM residual diagnostic statistic of vector Y

	AR(1)	***AR(3)***	***JB***	***ARCH***	***H****
Y	1.38 [0.27]	0.99 [0.52]	5.10 [0.53]		
LREER	1.54 [0.24]	2.48 [0.13]	2.15 [0.34]	0.04 [0.85]	
LBLAS	0.01 [0.97]	0.80 [0.52]	1.23 [0.54]	3.09 [0.09]	
LOPEN	0.05 [0.82]	3.26 [0.07]	0.74 [0.68]	2.01 [0.17]	

(*) not enough observations

III.19.2. Reduced rank statistic

Eigenvalues	***H0: rank ≤***	***Trace test***
	0	55.52 [0.00]**
0.845	1	10.70 [0.58]
0.281	2	2.76 [0.63]
0.108	3	

III.19.3. Adjustment coefficients and standardized eigenvectors (scale on diagonal)

α	***α1***	***α2***	***α3***
LREER	-0.61	-0.04	0.02
LBLAS	0.04	-0.07	0.01
LOPEN	-0.78	-0.04	-0.09

β	***β1***	***β2***	***β3***
LREER	1	-0.12	-1.98
LBLAS	-1.67	1	0.02
LOPEN	0.68	-0.55	1
Constant	-0.09	-1.69	4.06

III.19.4. Adjustment coefficients and restricted eigenvectors

III.19.4.1. Adjustment coefficients and restricted eigenvectors: α(LBLAS) =0.

LR test of restrictions: $\chi 2(1) = 0.46$ [0.49]

A	***α1***
LREER	-0.64 (0.11)
LBLAS	0
LOPEN	-0.72 (0.42)

β	***β1***
LREER	1
LBLAS	-1.66 (0.09)
LOPEN	0.67 (0.05)
Constant	-0.12

III.19.4.2. Adjustment coefficients and restricted eigenvectors: α(LOPEN)=0.

LR test of restrictions: $\chi2(1) = 4.49$ [0.03] *

A	***α1***
LREER	-0.74 (0.09)
LBLAS	0.01 (0.06)
LOPEN	0

β	***β1***
LREER	1
LBLAS	-1.65 (0.09)
LOPEN	0.66 (0.05)
Constant	-0.11

III.19.4.3. Adjustment coefficients and restricted eigenvectors: α(LBLAS)=0 and α(LOPEN)=0

LR test of restrictions: $\chi2(2) = 4.522$ [0.104]

A	***α1***
LREER	-0.75 (0.08)
LBLAS	0
LOPEN	0

β	***β1***
LREER	1
LBLAS	-1.65 (0.09)
LOPEN	0.66 (0.05)
Constant	-0.12

Notes:

1. AR (1) and AR (3) are LM tests for first-order and 1 to 3 order autocorrelation; JB is the Jarque-Bera test for normality; ARCH is LM test for conditional heteroscedasticity; H is the White test for heteroscedasticity.
2. Marginal significance levels of the test statistics are presented in square brackets.
3. Standard errors of coefficients estimated are in parentheses.

We perform weakly exogenous tests in the form of restrictions on adjustment parameters using the Likelihood ratio (LR) tests that are reported in table III.19.4.1 ÷ III.19.4.3. The results do not reject the weak exogeneity of the relative productivity and of the trade openness variables (at the 10% confidence level).

The cointegrating vector can be represented in the form of the following long-run relationship: $LREER_t = 1.65*LBLAS_t – 0.66*LOPEN + 0.12$.

The elasticity coefficients indicate that an increase in the relative productivity of 1% leads to an appreciation of the RER of 1.65%, and that a 1% rise in the trade openness leads the REER to depreciate by 0.7%. Our results are economically reasonable. Jongwanich (2010) on China, Hong Kong, India, Indonesia, Korea, Malaysia, Singapore, and Thailand

finds absolute values of elasticity coefficients of productivity differentials at 0.17 to 1.23, and of trade openness from 0.05 to 0.58 using quarterly frequency data. Diop et al. (2018) on Senegal find a coefficient of the relative productivity at 0.48 and the coefficient of trade openness at 0.52 using annual data.

The error-correction parameter of LREER is -0.75. It indicates that LREER changes reduce the gap between the actual and the equilibrium RER levels approximately by 75% per year.

Figure III.15 shows the tests of constancy and specification stability of the parameters in the cointegration vector. The results confirm that the model is stable since the parameters of the cointegration vector are within the confidence intervals over the period.

We also estimate the short-run dynamics of the variables in the VECM system of three equations, deleting short-run variables with insignificant estimated coefficients. The results are reported in table III.20. Results reported in table III.20 show that the short-run dynamics of the REER depend on the shocks in the trade openness after 1 year and it adjusts toward the equilibrium level with the speed of 40% per year. Interestingly, the relative productivity depends on shocks of trade openness and of the real effective exchange rate in the short-run after 1 year. However, the change in trade openness only depends on the real effective exchange rate shocks after 1 year.

Table III.20. The short-run dynamic of LREER, LBLA and LOPEN

ΔLREER		**ΔLBLA**		**ΔLOPEN**	
ΔLREER(-1)	0.69 (0.17)	ΔLREER(-1)	0.12 (0.05)	ΔLREER(-1)	-1.15 [0.41]
ΔLOPEN(-1)	0.41 (0.12)	ΔLOPEN(-1)	0.11 (0.03)		
EC	-0.40 (0.16)				
R^2	0.72	R^2	0.5	R^2	0.49
Adj. R^2	0.58	Adj. R^2	0.3	Adj. R^2	0.27
AR (1)	181 [0.20]	AR (1)	0.31 [0.74]	AR (1)	2.09 [0.16]
ARCH	0.10 [0.75]	ARCH	0.89 [0.35]	ARCH	1.01 [0.32]
JB	0.49 [0.78]	JB	9.02 [0.01]	JB	2.00 [0.37]
H	1.14 [0.44]	H	0.88 [0.58]	H	1.44 [0.29]

Misalignment of the RER

Misalignment is considered as the gap between the actual and the equilibrium level of the RER,

Misalignment = Actual LREER – Equilibrium LREER

Figure III.16 depicts the misalignment of the RER in the period from 1990 to 2016. Misalignments are somewhat limited (they are rarely higher than 10% in absolute value from the equilibrium levels). The results indicate that the RER is undervalued in 1990-1995 and 2009-2013. However, the RER is overvalued in 1995-1997, 2006-2009, and 2013-2016. It was close to equilibrium in 1998-2006 (while moving from a slight overvaluation to a slight undervaluation). In 2007-2008 however, there was a quick shift from overvaluation to undervaluation of the RER.

Figure III.15. Tests of coefficient constancy and specification stability in the long run.

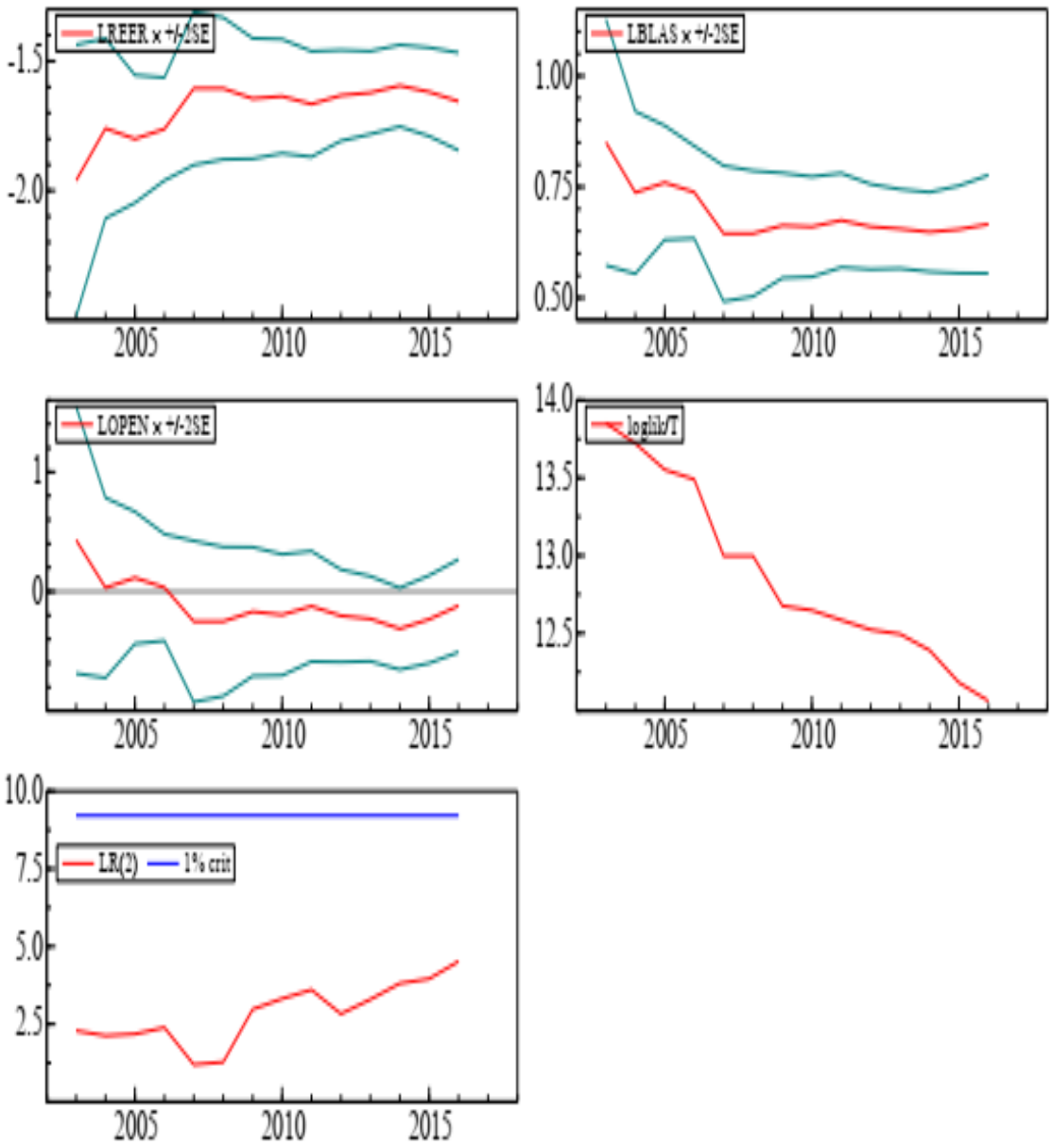
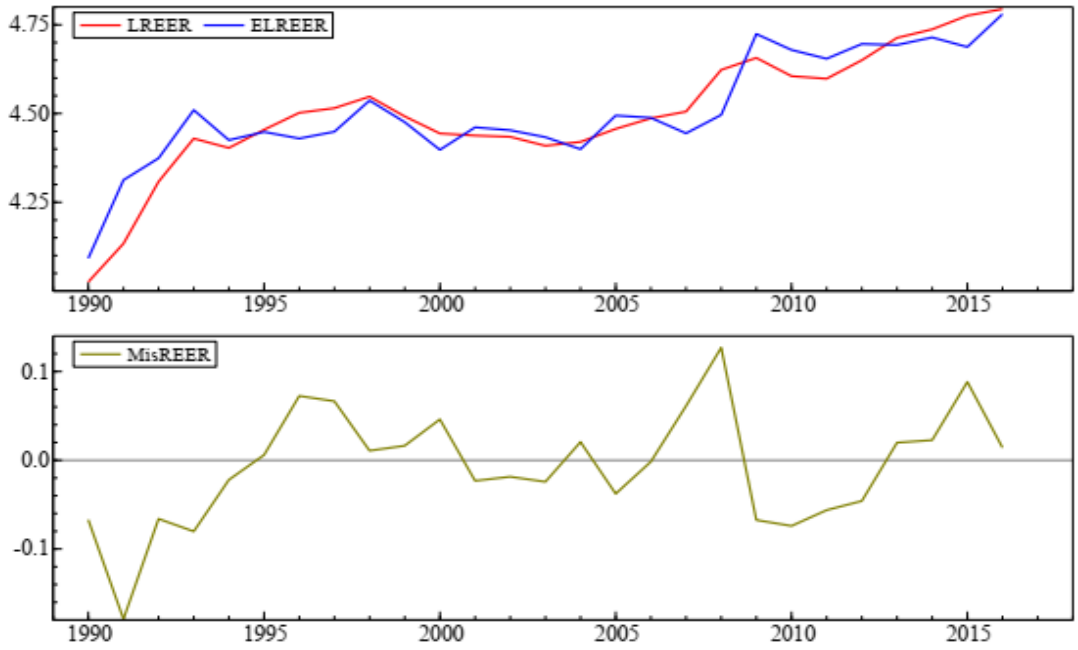


Figure III.16. The graphics of misalignment of RER.



CONCLUSION

Several observers considered that the RER was overvalued in Vietnam in the past (IMF (2006), Nguyen (2007), Nguyen and Nguyen (2010)). We effectively show that series of observed RERs with monthly and annual frequencies display an appreciation of the RER, but which would not correspond to overvaluation if the equilibrium level of the RER also appreciates.

In our study, we first examine the PPP hypothesis. Applying the conventional methods of unit root tests and cointegration analysis, the results indicate that the PPP can be rejected for Vietnam. This first exploration reveal that the RER, and its potential equilibrium level, change over time and could be influenced by fundamental factors of the economy.

We address an important issue in this framework in including the "Balassa-Samuelson effect" in the set of fundamentals. We investigate the long-run equilibrium RER employing the Johansen cointegration approach, the result indicates that the RER is impacted by the relative productivity and trade openness in the long run. The misalignment shows that the RER is overvalued over 1995-1998 and 2007-2010 while being undervalued over 1990-1994 and 2010-2013. These results indicate that Monetary

authorities should elaborate a flexible exchange rate policy based on fundamental factors of the economy, with the aim to maintain Vietnam economy's competitiveness.

References

Acaravci, A., & Ozturk, I. (2010). Testing purchasing power parity in transition countries: evidence from structural breaks. *Amfiteatru Economic Journal,* 12(27), 190-198.

Agénor, P. R., & Montiel, P. J. (2015). Development macroeconomics. *Princeton University Press.*

Aukrust, O. (1977). Inflation in the open economy: A Norwegian model. *Statistisk sentralbyrå.*

Aydin M. (2018). Examination of the validity of purchasing power parity (PPP) with fractured fourier unit root tests: the case of fragile five countries. *Journal of Applied Research in Finance and Economics, 3*(4), pp.18-28.

Baffes, J., O'Connell, S. A., & Elbadawi, I. A. (1999). Single-equation estimation of the equilibrium RER. *The World Bank.*

Baharumshah, A. Z., & Ariff, M. (1997). Purchasing power parity in South East Asian countries economies: a cointegration approach. *Asian Economic Journal,* 11(2), 141-153.

Bahmani-Oskooee, M., Goswami, G. G., & Mebratu, S. (2006). Black market premium and income distribution. *The Journal of Developing Areas,* 17-28.

Bahmani-Oskooee, M., & Tanku, A. (2006). Black market exchange rate, currency substitution and the demand for money in LDCs. *Economic Systems, 30*(3), 249-263.

Bahmani-Oskooee, M., Chang, T., & Wu, T. (2014). Revisiting purchasing power parity in African countries: panel stationary test with sharp and smooth breaks. *Applied Financial Economics,* 24(22), 1429-1438.

Bui, D.H., Makin, A.J., and Ratnasiri, S. (2017). Is Vietnam's exchange rate overvalued? *Journal of the Asia Pacific Economy*, Vol 22, 2014, 357-371.

Bulent Guloglu, Serdar Ispira & Deniz Okat (2011) Testing the validity of quasi PPP hypothesis: evidence from a recent panel unit root test with structural breaks, *Applied Economics Letters*, 18:18, 1817-1822, DOI: 10.1080/13504851.2011.564124.

Candau, F., Goujon, M., Hoarau, J. F., & Rey, S. (2014). RER and competitiveness of an EU's ultra-peripheral region: La Reunion Island. *International Economics*, *137*, 1-21.

Chang, T., & Su, C. W. (2013). Revisiting purchasing power parity for East Asian countries using the rank test for nonlinear cointegration. *Applied Economics*, 45(19), 2847-2852.

Clark, P. B., & MacDonald, R. (1999). Exchange rates and economic fundamentals: a methodological comparison of BEERs and FEERs. In *Equilibrium exchange rates* (pp. 285-322). Springer, Dordrecht.

Devarajan, S., & Melo, J. D. (1987). Adjustment with a fixed exchange rate: Cameroon, Côte d'Ivoire, and Senegal. *The World Bank Economic Review*, *1*(3), 447-487.

Dickey, D. A., & Fuller, W. A. (1979). Distribution of the estimators for autoregressive time series with a unit root. *Journal of the American statistical association*, *74*(366a), 427-431.

Dickey, D. A., & Fuller, W. A. (1981). Likelihood ratio statistics for autoregressive time series with a unit root. *Econometrica: Journal of the Econometric Society*, 1057-1072.

Diop, M., Goujon, M., and Niang, B.B. (2018). L'impact des déséquilibres du taux de change réel sur la performance du secteur manufacturier au Sénégal. *Revue d'économie du développement* 2018/1 (Vol. 26), p. 107-138.

Edwards, S. (1988). Real and monetary determinants of RER behavior: Theory and evidence from developing countries. *Journal of development economics*, *29*(3), 311-341.

Elliott, G., Rothenberg, T. J., & Stock, J. H. (1992). Efficient tests for an autoregressive unit root.

Engle, R. F., & Granger, C. W. (1987). Co-integration and error correction: representation, estimation, and testing. *Econometrica: journal of the Econometric Society*, 251-276.

Faruk Mike & Oktay Kızılkaya (2019) Testing the theory of PPP for emerging market economies that practice flexible exchange rate regimes, *Applied Economics Letters*, 26:17, 1411-1417, DOI: 10.1080/13504851.2018.1564111

Froot, K. A., & Rogoff, K. (1995). Perspectives on PPP and long-run RERs. *Handbook of international economics*, *3*, 1647-1688.

Gala, P. (2007). RER levels and economic development: theoretical analysis and econometric evidence. *Cambridge Journal of economics*, 32(2), 273-288.

Haldrup, N., & Jansson, M. (2005). Improving size and power in the unit root testing. *Aarhus University Economics Paper*, (2005-02).

Haug, A. A., & Basher, S. A. (2011). Linear or nonlinear cointegration in the purchasing power parity relationship?. *Applied Economics*, 43(2), 185-196.

Helpman, E., Sinn, H. W., Razin, O., Collins, S. M., Yuen, C. W., Schjelderup, G., & Sorgard, L. (1999). The economics of globalization: policy perspectives from public economics. *Cambridge University Press*.

Hinkle, L. E., & Monteil, P. J. (1999). Exchange rate misalignment: Concepts and measurement for developing countries. *Oxford University Press*.

IMF. (2006). IMF country report No. 06/421.

Johansen, S. (1995). Likelihood-based inference in cointegrated vector autoregressive models. *Oxford University Press* on Demand.

Jongwanich, J. (2009). Equilibrium RER, misalignment, and export performance in developing Asia. *Asian Development Bank Economics Research Paper Series*, (151).

Karagöz, K., & Saraç, T. B. (2016). Testing the validity of PPP theory for Turkey: nonlinear unit root testing. *Procedia economics and finance*, *38*, 458-467.

Kargbo, J. M. (2003). Cointegration tests of purchasing power parity in Africa. *World Development*, 31(10), 1673-1685.

Kim, Y. (1990). Purchasing power parity in the long run: a cointegration approach. *Journal of Money, Credit and Banking*, 22(4), 491-503.

Kwiatkowski, D., Phillips, P. C., Schmidt, P., & Shin, Y. (1992). Testing the null hypothesis of stationarity against the alternative of a unit root: How sure are we that economic time series have a unit root? *Journal of econometrics*, *54*(1-3), 159-178.

Liew, V. K. S., Chia, R. C. J., & Ling, T. H. (2010). Long-run validity of purchasing power parity and rank tests for cointegration for Central Asian Countries. *Applied Economics Letters*, 17(11), 1073-1077.

Lopez, C., Murray, C. J., & Papell, D. H. (2005). State of the art unit root tests and purchasing power parity. *Journal of Money, Credit and Banking*, 361-369.

MacDonald, R., & Ricci, L. A. (2004). Estimation of the equilibrium RER for South Africa. *South African Journal of Economics*, *72*(2), 282-304.

Mills, T. C. (2019). Applied Time Series Analysis: A Practical Guide to Modeling and Forecasting. *Academic Press.*

Nguyen, T.T.H., & Dinh, T.M., & To, T.T., & Le, H.G., and Pham, V.H. (2010). Vietnam annual report 2010: The choice for sustainable growth - Chapter 4. *Nhà Xuất Bản Tri thức*, Hà Nội, 6/2010 (in Vietnamese). Link: http://dl.ueb.vnu.edu.vn/bitstream/1247/52/2/NC-21.pdf

Prasad, E. S., Rajan, R. G., & Subramanian, A. (2007). Foreign capital and economic growth (No. w13619). *National Bureau of Economic Research.*

Phillips, P. C., & Perron, P. (1988). Testing for a unit root in time series regression. *Biometrika*, *75*(2), 335-346.

Phuc, N. T., & Duc-Tho, N. (2009). Exchange rate policy in Vietnam, 1985–2008. *ASEAN Economic Bulletin*, *26*(2), 137-163.

Salter, W. E. (1959). Internal and external balance: the role of price and expenditure effects. *Economic Record*, *35*(71), 226-238.

Sideris, D. (2006). Purchasing power parity in economies in transition: evidence from Central and East European countries. *Applied financial economics*, *16*(1-2), 135-143.

Stein, L.L. (1994). "The natural RER of the US dollar and determinants of capital flows", in *J. Williamson (ed), Equilirium exchange rates*, Institute for international economics, Washington D.C, pp.133-176.

Stein, J. L., & Allen, P. R. (1997). Fundamental determinants of exchange rates. *Oxford University Press.*

Swan, T.W. (1960). Economic control in a dependent economy. *Economic Record*, *36*(73), 51-66.

Tiwari, A. K., & Shahbaz, M. (2014). Revisiting Purchasing Power Parity for India using threshold cointegration and nonlinear unit root test. *Economic Change and Restructuring*, 47(2), 117-133.

Thuy, V., & Thuy, D. (2019). The impact of exchange rate volatility on exports in Vietnam: A bounds testing approach. *Journal of Risk and Financial Management*, *12*(1), 6.

Vinh, N. T. T. (2011). The impact of oil prices, real effective exchange rate and inflation on economic activity: Novel evidence for Vietnam (No. DP2011-09).

Vuong, Q.H. (2003). Essays on Vietnam's financial reforms: Foreign exchange statistics and evidence of long-run equilibrium. *Economis Studies Review*, Vol. 43, Nos. 6-8, June-August 2003.

Zivot, E & Wang, J. (2006). Modeling Financial Time Series with S-Plus.

Williamson, J. (1994). Estimating equilibrium exchange rates. *Peterson Institute*.

Yein Shim, Hyeyoen Kim, Sunghyun Kim & Doojin Ryu (2016) Testing the relative purchasing power parity hypothesis: the case of Korea, *Applied Economics*, 48:25, 2383-2395, DOI: 10.1080/00036846.2015.1119795.

Appendix III.1.

The summary of results in measure of REER for Vietnam

Author	Method	Period
Nguyen, T.P and Nguyen, D.T (2009)	NEER is measured by geometric means method, NEER = $\prod_{j=1}^{n}(Eij)^{Wjt}$ REER = $\prod_{j=1}^{n}\{Eij\ \frac{Pt}{Pjt}\}^{Wij}$ Where Eij is nominal bilateral exchange rate of Vietnam against partners j; Wjt is trade weight of Vietnam to countries j (it is computed as the ratio of import + export of country j to total of trade in Vietnam); Pt is the domestic price index at time t and Pjt is the price index of foreign country j at time t;	Annual data from 1992-2007 and monthly data from 1995-2007; The currency basket includes 25 mainly trading partners with Vietnam.
Le, V.T and Nguyen, T.T.V. (2011)	The real effective exchange rate is computed by geometric mean method, REER = $\prod_{j=1}^{n}\{Eij\ \frac{Pt}{Pjt}\}^{Wij}$ Where Eij is nominal bilateral exchange rate relative to currency j (measured as units of foreign currency per unit of domestic currency); Wjt is weight assigned to currency j at time t (it is ratio of trading of partners j with Vietnam and in the total of Vietnam's trade; Pt is domestic price index; Pjt is relative price index of country j;	The currency basket includes 20 mainly trading partners with Vietnam. Monthly data is from 1995:m1 to 2009:m3.
Nguyen, T.T.V and Seiichi, F (2007)	The real effective exchange rate is measured as geometric mean method,	Quarterly data is from 1994-2013. The currency basket includes

	$$REER = \sum_{j=1}^{n} Eij \,.\, \frac{CPI_j^i}{CPI^i} \,.\, W^j$$ Where Eij is nominal bilateral exchange rate of Vietnam with trading partners j, Wj is trade proportion of partners j with Vietnam that measured as ratio of export and import of partners j with trade total of Vietnam.	10 mainly trading partners with Vietnam.
Nguyen, K.L., and Cao, H.V. (2016)	The NEER and REER is measured as follows, $$REER\ (t) = \frac{NEER\ .\ CPI_i}{CPI_i^{foreign}}$$ $$NEER(t) = \prod_{i=1}^{n} S.(I)_t^{Wi}$$ Where NEER is geometrical weighted average of S(I); S(I) is nominal bilateral exchange rate between country I with its trading partners; $CPI_t^{foreign} = \prod_{i=1}^{n}(CPI)_t^{Wi}$ is geometrical weighted average of CPI indices of trading partners; and CPIi is CPI index of trading partners; Wi is the weight of trading partner.	Annual data is from 1995-2014. Data of NEER and REER is collected from site web: http://bruegel.org
Nguyen, T.T.H., & Dinh, T.M., & To, T.T., & Le, H.G., and Pham, V.H. (2010). (in Vietnamese).	The NEER and REER are measured: $$NEER_t = \prod_{j=1}^{n} (e_{jt})^{w_{jt}} \qquad REER_t = \prod_{j=1}^{n} (e_{jt} \frac{P_{jt}}{P_t})^{w_{jt}}$$ Where NEER is nominal effective exchange rate, REER is real effective exchange rate; e is nominal bilateral exchange rate between foreign currency and Vietnam; P is consumer price index. w is average weighted trade of 10 mainly partners.	

Bui, D.H., Makin, A.J., and Ratnasiri, S. (2016)	The REER is calculated as a form: $REER_t = \prod_{j=1}^{n}\left(e_{jt}\frac{P_t}{P_{jt}}\right)^{w_{jt}}$ Where e_{jt} is nominal bilateral exchange rate relative to currency j, w_{jt} is the weight assigned to currency j, P_t is the domestic price index, P_{jt} is the price index of foreign currency.	Quarterly data from 1995Q4 to 2014Q2.
Nguyen, T.T.V and Trinh, T.T.D (2019)	The real effective exchange rate is calculated as, $\mathrm{REER_t} = \prod_{j=1}^{n}\left(\mathrm{NER_t^j}\frac{\mathrm{CPI_t^j}}{\mathrm{CPI_t^{VN}}}\right)^{\mathrm{w_{jt}}}$ where REER is real effective exchange rate, NER is nominal bilateral exchange rate, CPI is consumer price index, w is trade-weight. The currency basket includes the currencies of Vietnam's twenty largest trading partners.	Quarterly data from 2000.Q1 – 2014.Q4

Appendix III.2.

VECM of (REER), vector Y= {LREER, LBLAS, LOPEN, LEXPEN}

III.2.1. Model (a determined trend, 3 lags)

1. Residual diagnostic statistic of vector Y

	AR(1)	***AR(3)***	***JB***	***ARCH***	***H****
Y	1.07 [0.47]	1.21 [0.44]	6.22 [0.62]		
LREER	34.4 [0.00]	3.89 [0.04]	1.90 [0.38]	1.81 [0.19]	
LBLAS	0.13 [0.72]	0.12 [0.94]	2.71 [0.25]	0.01 [0.91]	
LOPEN	0.89 [0.36]	11.0 [0.01]	2.04 [0.35]	0.23 [0.63]	
LEXPEN	2.57 [0.14]		0.85 [0.65]	1.92 [0.17]	

(*) not enough observations

2. Reduced rank statistic

Eigenvalues	***H0: rank ≤***	***Trace test***
	0	105.10 [0.00]**
0.900	1	49.66 [0.00]**
0.712	2	19.73 [0.24]
0.373	3	8.50 [0.22]
0.298	4	

3. Adjustment coefficients and standardized eigenvectors (scale on diagonal)

α	***α1***	***α2***	***α3***	***α4***
LREER	0.01	1.7	0.18	0.09
LBLAS	0.01	-0.09	0.05	-0.03
LOPEN	0.08	-1.11	-0.38	0.19
LEXPEN	0.08	0.65	-0.16	-0.31

β	***β1***	***β2***	***β3***	***β4***
LREER	1	-0.3	1.5	-0.45
LBLAS	-85	1	-2.9	0.53
LOPEN	-3	-0.01	1	-0.99
LEXPEN	7	0.02	1.6	1

Trend	2.2	-0.02	-0.01	0.02
Constant	330	-2.9	-3.1	0.69

III.2.2. Model (without determined trend, 3 lags)

1. Residual diagnostic statistic of vector Y

	AR(1)	***AR(3)***	***JB***	***ARCH***	***H****
Y	1.55 [0.22]	6.87 [0.01]	5.86 [0.66]		
LREER	24.8 [0.00]	2.77 [0.11]	0.97 [0.61]	0.06 [0.80]	
LBLAS	0.40 [0.54]	0.41 [0.75]	4.31 [0.11]	0.16 [0.68]	
LOPEN	0.04 [0.84]	7.45 [0.01]	1.51 [0.46]	1.64 [0.21]	
LEXPEN	1.19 [0.30]		0.01 [0.99]	0.00 [0.97]	

(*) not enough observations

2. Reduced rank statistic

Eigenvalues	***H0: rank ≤***	***Trace test***
	0	63.83 [0.00]**
0.758	1	29.75 [0.17]
0.379	2	18.30 [0.09]
0.344	3	8.17 [0.07]
0.288	4	

3. Adjustment coefficients and standardized eigenvectors (scale on diagonal)

α	***α1***	***α2***		***α3***
LREER	-0.32	-0.32	0.08	0.03
LBLAS	-0.01	-0.20	-0.01	-0.01
LOPEN	-0.26	0.53	-0.18	0.18
LEXPEN	-0.58	-0.14	-0.21	-0.11

β	***β1***	***β2***	***β3***	
LREER	1	-0.51	0.50	
LBLAS	-0.63	1	-3.37	
LOPEN	0.18	-0.28	1	
LEXPEN	-0.39	-0.45	2.83	

Constant	-1.48	0.56	-1.15	

III.2.3. Model (a trend, 2 lags)

1. Residual diagnostic statistic of vector Y

	AR	***JB***	***ARCH***	***H***
Y	2.09 [0.05]	3.91 [0.86]		0.50 [0.95]
LREER	13.4 [0.00]	1.41 [0.49]	0.01 [0.93]	0.54 [0.84]
LBLAS	0.09 [0.76]	2.69 [0.26]	0.64 [0.43]	1.33 [0.40]
LOPEN	0.32 [0.57]	0.59 [0.74]	0.50 [0.48]	0.64 [0.77]
LEXPEN	1.08 [0.31]	0.99 [0.60]	1.81 [0.19]	0.68 [0.74]

2. Reduced rank statistic

Eigenvalues	***H0: rank ≤***	***Trace test***
	0	93.33 [0.00]**
0.892	1	39.73 [0.10]
0.567	2	19.62 [0.25]
0.364	3	8.73 [0.20]
0.304	4	

3. Adjustment coefficients and standardized eigenvectors (scale on diagonal)

α	***α1***	***α2***	***α3***	***α4***
LREER	0.01	-0.02	0.15	0.07
LBLAS	0.06	-0.01	0.03	-0.01
LOPEN	0.37	-0.21	-0.42	0.06
LEXPEN	0.12	-0.92	-0.02	-0.08

β	***β1***	***β2***	***β3***	***β4***
LREER	1	0.79	0.09	-3.3
LBLAS	-8.81	1	-0.86	7.1
LOPEN	0.22	0.32	1	-2.19
LEXPEN	1.36	0.67	0.70	1
Trend	0.18	-0.06	-0.03	-0.05
Constant	26.3	-10.7	-2.99	-8.6

III.2.4. Model (without trend, 2 lags)

1. Residual diagnostic statistic of vector Y

	AR(1)	***JB***	***ARCH***	***H***
Y	2.18 [0.04]	7.54 [0.47]		0.69 [0.84]
LREER	9.23 [0.00]	1.03 [0.59]	0.01 [0.91]	0.56 [0.83]
LBLAS	0.53 [0.60]	0.54 [0.76]	0.00 [0.95]	2.24 [0.14]
LOPEN	0.93 [0.41]	2.17 [0.33]	3.85 [0.06]	0.61 [0.79]
LEXPEN				

2. Reduced rank statistic

Eigenvalues	***H0: rank ≤***	***Trace test***
	0	68.33 [0.00]**
0.756	1	34.48 [0.05]
0.471	2	19.19 [0.06]
0.357	3	8.59 [0.06]
0.300	4	

3. Adjustment coefficients and standardized eigenvectors (scale on diagonal)

α	***α1***	***α2***	***α3***	***α4***
LREER	0.02	0.05	0.13	0.08
LBLAS	0.08	0.02	0.03	-0.01
LOPEN	0.40	0.11	-0.48	0.04
LEXPEN	-0.13	0.35	-0.08	-0.10

β	***β1***	***β2***	***β3***	***β4***
LREER	1	-1.36	0.36	-2.9
LBLAS	-2.11	1	-2.12	4.7
LOPEN	0.49	-0.02	1	-1.9
LEXPEN	1.27	-0.45	0.63	1
Constant	-1.32	3.55	1.04	-1.5

GENERAL CONCLUSION

After three decades of performing economic reforms towards a socialist-oriented market economy (Vietnamese: Kinh tế thị trường theo định hướng xã hội chủ nghĩa), Vietnam has been characterized by a structural transformation from an agricultural to a modern economy opened to international markets. The country has shown several impressive results, such as high economic growth, reducing poverty, and improving living standard. Thanks to these results, Vietnam has emerged from the low-income to the lower-middle income category as classified by the World Bank. However, the economy also exhibits weaknesses such as, for example, (1) a high and volatile inflation; (2) suspicion of exchange rate overvaluation that would lower the competitiveness of the domestic goods in international trade.

In this thesis, several issues of monetary policy and exchange rate policy are analyzed in the context of a transition economy. The results of these studies give suggestions to the Vietnam authorities in conducting the monetary and exchange rate policies. This thesis is divided into three chapters.

Chapter 1 focused on monetary policy that led to analyzing a function of money demand to test whether the State Bank of Vietnam can find an appropriate monetary aggregate as an intermediate target to help achieving price level stability and economic growth.

To answer this question, we investigated the money demand function using data covering the period from January 2000 to December 2016 applying a standard cointegration approach. We examine both the monetary aggregate of domestic currency and the broader aggregate that includes foreign currency. The aggregate of the domestic currency (M2D) includes the dong in circulation outside banks and the dong demand deposits in the banking system. The broader monetary aggregate (M2) is composed of M2D plus foreign currency deposits. M2 is often considered in conducting monetary policy in Vietnam, given the partial dollarization of the banking system and an expected stronger link with

real transactions (and eventually inflation). However, foreign currency deposits have a share of only 13.6% in M2 over 2000-2016 and M2 does not include dollar currency in circulation outside banks. It would also show a weaker link with the opportunity costs of holding money since it includes both non-hedging and hedging assets. Contrastingly, M2D could display a more stable relationship with money demand factors and would be easier to follow by the authorities. This is why we test for a money demand function for both M2 and M2D.

First, we find that the interest rate is not a relevant determinant in the money demand function, that would signal heavy administrative controls that do not allow market determination and equilibrating fluctuations in an under-developed monetary market for the domestic currency in Vietnam. The result is consistent with previous empirical works. Bhattacharya (2014), on the period of 2001: Q1 to 2012: Q4, finds that interest rates have no relationship with M2 (but only with credit growth). Pham and Riedel (2012) 's results reveal that the authorities, in the conduct of monetary policy, are reliant on administrative controls, such as control on interest rates, targets on credit growth, quotas on lending by sectors, which distort the credit markets resulting in capital miss-allocation.

Second, the results indicate that real money demand is highly sensitive to the expected inflation rate and to the depreciation of the exchange rate. Together with the exclusion of the interest rates as a determinant of the demand for money, this signals that real assets are more attractive than financial assets when economic agents look for hedging against inflation. Particularly, the prices of real assets usually increase more than the rate of return of financial assets. Furthermore, the stock market is immature and thin, and economic agents are turning to land and housing markets and/or to the gold market to buy stores of value and speculative assets.

Third, results show the inflation rate is not significantly affected by excess money (measured by the gap between M2D supply and the estimated demand). It would, however, be affected by short-run monetary shocks and also by wages, the world prices, but it would also be inertial.

The result of the estimation of the money demand function for M2 (including foreign currency) exhibits a weak impact of the opportunity cost of holding money because it includes foreign currency deposits that is considered as hedging assets. When the costs

of holding domestic currency increase, the economic agents may convert to foreign currency of which the price may increase.

In chapter 2, we explore the relationship between the official and the black exchange rates using data from January 2000 to December 2015. Although the Vietnamese authorities seem to overlook the role of the black exchange market, we investigate the importance of this market and the nature of the relationships between the official and the black markets of foreign exchange.

First, we explore an expected relationship between the black and official exchange markets, and whether the official rate or the black rate are driven by the black market premium.

Second, we use the standard cointegration approach to test the relationship between the two exchange rates. The result shows that such a relationship exists between the two exchange rates in the long run. It implies that the two exchange markets are not fully segmented. We find that only the changes in the official exchange rate are influenced by the black market premium (the deviation from the long-run relationship). It suggests that changes in the black exchange rate lead the State Bank of Vietnam to adjust the official exchange rate to eliminate the gap between both rates in the long run. We can not reject the hypothesis that the SBV employs the black exchange rate to form exchange rate expectations or as a proxy for the exchange rate equilibrium level to be targeted.

Third, because the black exchange rate is not driven by deviation from the long-run relationship, it implies that the black market is relatively autonomous vis-à-vis the official market. In the long run, supply-demand conditions in the official market do not affect supply-demand conditions in the black market. Moreover, agents operating in the black market do not use information from the official market, which would be revealed by current changes in the official exchange rate, in a simple way. It would inversely reveal that agents in the black market use external information that would allow them to form specific expectations on the exchange rate, which, under self-fulfilling expectations, affect the current black exchange rate.

In chapter 3, we study the dynamics of the real exchange rate over the period 1990-2016.

First, we propose different measures of the real exchange rate using both theoretical and empirical works. We calculate the bilateral real exchange rate of the Vietnam dong against a number of foreign currencies, of which the US dollar and the Chinese Yuan. The real effective exchange rates are measured as a weighted geometric mean of the bilateral real exchange rates.

Second, the hypothesis of purchasing power parity is tested using unit root tests and cointegration analysis. The results show that the purchasing power parity can be rejected in the case of Vietnam over the period. It implies that the changes in the nominal exchange rate and in the relative price level are not equal or proportional.

Third, we investigate the dynamics of the real exchange rate by looking for the equilibrium real effective exchange rate based on the Balassa-Samuelson hypothesis. The results show that a long-run relationship exist between the real effective exchange rate, the relative productivity and trade openness.

The examination of the misalignment of the real exchange rate allows suggestions to the Vietnamese authorities in implementing the exchange rate policy. A flexible exchange rate policy based on the fundamental factors could preserve the competitiveness of the Vietnamese economy. Furthermore, this policy would help to gradually unify the two foreign exchanges which would contribute to fighting against the volatility of inflation in Vietnam.

Conclusively, the money market is thin and still underdeveloped as witnessed by the interest rates that are still administered while not being an opportunity cost of holding money in the long term. Therefore, real assets remain more attractive than financial assets. In addition, the rate of change in real asset prices is usually higher than the rate of return of financial assets, leading economic agents to possess real assets to preserve purchasing power (gold, real estates, cars…). Furthermore, restrictions in the access to the official forex market and the rigidity of the official exchange rate, also make foreign currencies a store of value to hedge against inflation. Consequently, money and resources can be diverted from investing in economic activities, making the goals of monetary policy such as economic growth and stability of price level difficult to achieve.

Although the *"doi moi"* was launched in 1986 with the goal of transforming the economy towards a market economy, it seems that Vietnam is still in the transition process. Regarding the monetary policy and the exchange rate policy, a number of reforms still seem necessary. Arguably, the independence of the State Bank of Vietnam should be reinforced to facilitate and strengthen the credibility of further reforms.

Reference

Bhattacharya, R. (2014). Inflation dynamics and monetary policy transmission in Vietnam and emerging Asia. *Journal of Asian Economics*, *34*, 16-26.

Pham, T. T. T., & Riedel, J. (2012). On the conduct of monetary policy in Vietnam. *Asian-Pacific Economic Literature*, *26*(1), 34-45.